TETRA TECH

March 29, 2013

Mr. Roy Crossland
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Subject: **Removal Action Report**
Radiation – Standard Precision, Inc. (Former), Wichita, Kansas
CERCLIS ID KS0000900316
U.S. EPA Region 7 START 3, Contract No. EP-S7-06-01; Task Order No. 0303
Task Monitor: Megan Schuette, On-Scene Coordinator

Dear Mr. Crossland:

Tetra Tech, Inc. is submitting the attached Removal Action report for the Radiation – Standard Precision, Inc. (Former) site in Wichita, Kansas. If you have any questions or comments, please contact the Project Manager at (816) 412-1775.

Sincerely,

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START Project Manager

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Enclosure

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REMOVAL ACTION REPORT

RADIATION – STANDARD PRECISION, INC. (FORMER)
WICHITA, KANSAS

CERCLIS ID KS0000900316

Superfund Technical Assessment and Response Team (START) 3
Contract No. EP-S7-06-01, Task Order No. 0303

Prepared For:

U.S. Environmental Protection Agency
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March 29, 2013

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1.0 INTRODUCTION

The Tetra Tech, Inc. Superfund Technical Assessment and Response Team (START) was tasked by the U.S. Environmental Protection Agency (EPA) Region 7 Superfund Division to assist with a removal action (RA) at Radiation – Standard Precision, Inc. (Standard Precision) in Wichita, Sedgwick County, Kansas. The site was the location of the Standard Precision, Inc., facility that was granted a radioactive material license and operated until approximately 1968 (Kansas Department of Health and Environment [KDHE] 2007). An investigation at the site by KDHE, reported in March 2007, identified radium-226 impacted soil at the former Standard Precision site (KDHE 2007). Follow-up removal assessments by EPA identified radium-226 contamination in soils and elevated gamma readings in the interior of the on-site building near a loading dock (Tetra Tech EM Inc. [Tetra Tech] 2010). Based on information obtained during those investigations, EPA determined that a hazardous substance was present at levels that posed an imminent threat to human populations, thereby warranting a time-critical RA.

START activities for this RA included:

- Guiding excavation of radium-impacted soil and materials
- Conducting perimeter air monitoring for particulates and airborne radioactive material during soil excavation
- Conducting a Final Status Survey (FSS) in accordance with the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (EPA 2000a), including acquisition of real-time monitoring data and collection of post-removal samples for laboratory analysis for radionuclides
- Assessing FSS data, in accordance with MARSSIM, to determine if areas could be released for unrestricted use
- Documenting the removal activities.

Robert Monnig was the START Project Manager for the RA, and Megan Schuette was the EPA On-Scene Coordinator (OSC) for the project.

2.0 SITE DESCRIPTION AND BACKGROUND

Section 2.0 describes the site, summarizes previous investigations, and cites the EPA-specified RA level for radium-226.

2.1 SITE DESCRIPTION

The former Standard Precision facility was at 4105 West Pawnee in Wichita, Sedgwick County, Kansas (see Appendix A, Figures 1 and 2). The site is in the northeast quarter of Section 2, Township 28 South, Range 1 West. The approximate center of the site is at the following coordinates: 37.650780 degrees north latitude and 97.392100 degrees west longitude. The 4105 West Pawnee property encompasses approximately 4 acres and currently includes a large manufacturing and a smaller building with footprints of approximately 32,800 and 5,000 square feet, respectively. The property is currently occupied by Consolidated Equipment Company, Inc., (CECO), an aircraft parts fabricator.

2.2 PREVIOUS INVESTIGATIONS

KDHE performed a Unified Focus Assessment (UFA) at the Standard Precision site in 2007. A screening survey and soil sampling of the property by KDHE identified several discrete areas of radium-226 impacted soil (KDHE 2007). In addition, groundwater samples were collected from Geoprobe® locations on the Standard Precision property to the south of the CECO manufacturing building. An elevated concentration of radium-226 (26.1 picoCuries per liter [pCi/L]) was detected in groundwater collected from a location near a suspected buried sump. In addition, volatile organic compounds (VOC) were detected at concentrations exceeding heath-based benchmarks, including benzene, 1,1-dichloroethane, tetrachloroethylene, toluene, 1,1,1-trichloroethane, trichloroethylene, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene (KDHE 2007).

Several site investigations preceded the 2006/2007 UFA. These investigations are described in the KDHE UFA report and are summarized below (KDHE 2007).

1994 Preliminary Assessment/Screening Site Inspection (PA/SSI) of K42 and West Street Site
In 1994, KDHE conducted an integrated PA/SSI for the K42 and West Street site in Wichita, Kansas. The K42 and West Street site is located to the southeast of the former Standard Precision site. Groundwater at the K42 and West Street site was contaminated with aromatics, semi-volatiles, and VOCs. The PA/SSI concluded the property occupied by CECO, Inc. and formerly occupied by Standard Precision, located upgradient to the K42 and West Street site, was the likely source area for the groundwater contamination at the K42 and West Street site.

1996 Preliminary Investigation (PI) of Standard Precision Site
In 1996, Woodward-Clyde Consultants, under contract with National Cash Register Corporation (a former lessee of the Standard Precision property), conducted a PI of the Standard Precision property. The PI concluded that a former sump located south of the 4125 West Pawnee building loading dock appeared to be a source of groundwater contamination at the K42 and West Street site.

2000 Expanded Site Inspection (ESI) of K42 and West Street Site

In February 2000, KDHE conducted an ESI of the K42 and West Street site and concluded that the likely upgradient source for the western plume of groundwater contamination at the K42 and West Street Site was the former Standard Products facility. Contaminants in the groundwater plume included trichloroethylene, 1,1,1-trichloroethane, 1,1-dichloroethane, and total (cis/trans) 1,2-dichloroethylene. During the ESI, Mr. M.J. "Buddy" Edwards III of CECO, Inc. reportedly indicated in an interview with the KDHE field team that the former sump on the Standard Precision property was backfilled in 1990 during a sewer connection project and lies under a portion of concrete paving near the loading dock.

2005 Limited Site Investigation of Standard Precision Site

In 2005, Terracon (on behalf of CECO, Inc.) conducted a Limited Site Investigation the 4105 and 4125 West Pawnee property (former Standard Precision facility) assessing the presence of radium. High concentrations of radium-226 were found in the soils and groundwater on the former Standard Precision site, especially near the former sump area.

In February 2009, EPA tasked START to conduct a Removal Site Evaluation (RSE) to determine the extent of radium contamination (and associated radionuclides) in surface and subsurface soils at the former Standard Precision facility. RSE activities at the site in March 2009 included a surface soil gamma survey and collection of surface and subsurface soil samples. During the RSE activities, areas with total gamma radiation readings above background were identified at several areas of the site (see Appendix A, Figure 3). Laboratory results indicated a maximum radium-226 detection of 39.4 picoCuries per gram (pCi/g) in a soil sample collected from a boring advanced at the northwest corner of the property (Tetra Tech 2010). Based on the results of investigations by KDHE and EPA/START, an RA was determined warranted to reduce the risk to occupants of the site. EPA established a time-critical RA level for radium-226 of 5 pCi/g above background in soil.

In November 2010, START installed and sampled twelve temporary direct-push technology (DPT) wells, including wells immediately downgradient (to the southeast) of the reported abandoned sump, wells downgradient (southeast) of the former Standard precision property, and wells upgradient/crossgradient (north) of the facility (Tetra Tech 2011). The November 2010 groundwater sampling results suggest that groundwater impacted with VOCs was migrating off the facility, while radium-226 impacts to groundwater appear to be limited to a localized area near the reported sump location. START noted that, although VOCs were detected in groundwater samples collected downgradient of the former Standard Precision facility, groundwater in this area was not likely used as a drinking water source because the City of Wichita provides municipal water service to this area.

3.0 REMOVAL ACTIVITIES

In July and August 2012, excavation of radiologically impacted material and site restoration for this RA proceeded under the EPA Region 7 Emergency Response and Removal Services (ERRS) contract. The EPA ERRS contractor was Environmental Restoration (ER). Photographic documentation of the removal activities is in Appendix B. Field activities for the RA are documented in a field logbook, in Appendix C.

3.1 EXCAVATION AND ASSESSMENTS SUPPORTING REMOVAL ACTION

START arrived at the site on July 25, 2012, and began surveying proposed excavation areas for gross gamma activity using a Ludlum Model 2241-3 digital survey meter with a Ludlum Model 44-10 sodium iodide (NaI) scintillation detector (Ludlum 44-10 detector). Real-time surveying occurred by scanning the surface soil in a serpentine pattern, moving at approximately 1 to 2 feet per second, with the detector held approximately 6 inches above ground surface. These scanning measurements were used to guide the excavation of impacted material. The ERRS contractor excavated impacted material using a track-mounted hoe and hand shovels. Excavation of contaminated areas generally proceeded until gross gamma activity readings using the Ludlum 44-10 detector suggested that the EPA-established action level for radium-226 of 5 pCi/g above background had been achieved. In addition, measurements of soil samples in a shielded "well" composed of lead bricks provided additional information used to guide the excavation. EPA conducted these measurements.

The cleanup resulted in excavation at several areas of the property (see Appendix A, Figures 4 and 5). The following describes the areas excavated:

Area 1 – Northwest Corner of Property

A small discrete area with elevated gamma activity within a grass-covered area at the northwest corner of the property (see Appendix A, Figure 5) was excavated using a track-mounted hoe. Soil removal proceeded until gross gamma activity readings suggested the action level had been achieved, resulting in an approximately 5-foot-diameter excavation of approximately 6 inches in depth.

Area 2 – Interior Area and Exterior Pipe Run

This area is associated with an abandoned waste pipe that had apparently served an unknown and previously removed drain or fixture in the CECO building (4105 West Pawnee) (see Appendix A, Figure 4). During the RSE, a discrete area of elevated gamma readings had been observed along the concrete floor at the south side of the building near a loading dock; the elevated gamma readings generally extended along a line that exited the building and continued along the west edge of the loading

dock ramp. During the RA, an approximately 6.5- by 12-foot portion of concrete floor over the interior area of elevated gamma activity was removed. Removal of the concrete floor revealed a remnant portion of an unknown reinforced concrete structure that had been possibly served by the drain (see Appendix B, Photographs 1-3). The rectangular remnant structure still included a concrete base of approximately 4 by 6 feet and sides that had been mostly broken off and removed so that the building floor could be patched level. The structure was covered in sand that likely had been placed to fill void space when the floor had been patched. A strong solvent odor was detected after exposure of the structure. Elevated gamma readings appeared to be associated with the sand fill covering the remnant structure and soil adjacent to the structure; this material was excavated using a track-mounted hoe and hand tools. Removal of fill material around the structure proceeded until gross gamma activity readings over the area suggested that the EPA-established action level for radium-226 of 5 pCi/g above background (action level) had been achieved. The exterior buried pipe run was removed by cutting and excavating an approximately 18 inch-wide trench from the building (where the pipe exited) south to the sump excavation area—a length of approximately 37 feet (see Appendix B, Photograph 8). Elevated gamma readings appeared to be associated primarily with the waste pipe, and only limited fill material adjacent to the pipe had to be removed to obtain gross gamma activity readings with the Ludlum 44-10 that suggested the action level had been achieved.

Areas 3 and 4 – Area Abutting South Side of Detached Garage

An area of concrete sidewalk and grass lawn off the south side of the detached garage (see Appendix B, Photograph 7 and Appendix A, Figure 4) was excavated to a depth of approximately 8 to 12 inches using a track-mounted hoe. This area was identified as two discrete areas (Areas 3 and 4) during the RSE; however, excavation of an approximately 500-square-foot contiguous area was required to achieve gross gamma readings suggesting the action level had been achieved. To accomplish removal in this area, an approximately 30-foot length of concrete sidewalk that abutted the south edge of the detached garage had to be removed.

Area 5 – Small Discrete Area on South-Central Portion of Property

A small discrete area with elevated gamma activity within a grass-covered area in the south-central portion of the property (see Appendix A, Figure 4) was excavated using a track-mounted hoe. Soil removal proceeded until gross gamma activity readings suggested the action level had been achieved, resulting in an approximately 4-foot-diameter excavation to depth of approximately 1.5 feet.

Area 6 – Multiple Discrete Areas Along South Edge of Property

Multiple small discrete areas with elevated gamma activity along the south-central edge of the property boundary (see Appendix A, Figure 4 and Appendix B, Photographs 4 and 5) were excavated using a track-mounted hoe. Soil removal proceeded until gross gamma activity readings suggested the action level had been achieved, resulting in three discrete excavations of approximately 100 to 120 square feet to depths of 2 to 3 feet.

Sump Excavation

This area encompasses an excavation off the southwest corner of the loading ramp associated with an abandoned sump apparently formerly tied to the waste pipe removed from Area 2 (see Appendix A, Figure 4). Upon excavation of the waste pipe from Area 2, it was observed that the pipe terminated near the south end of the loading ramp, but that soil continued to exhibit elevated gross gamma readings. Excavation proceeded past where the pipe terminated and ultimately resulted in an approximately 12- by 15-foot excavation area off the southwest corner of the loading ramp. Excavation uncovered an abandoned concrete sump at a depth of approximately 3 to 4 feet below ground surface (bgs). The sump and surrounding soil exhibited elevated gross gamma readings and were removed. Elevated gross gamma readings in soil continued to trend to greater depth and in a southerly direction from the location where the sump had been unearthed. Excavation proceeded to a maximum depth of approximately 10 feet bgs. Gross gamma activity readings along the north, east, and west walls and the upper portion of the southern wall of the excavation suggested the action level had been achieved; however, elevated gross gamma readings remained along the south, bottom edge of the excavation that had reached a depth of approximately 10 feet bgs. Excavation was discontinued when it appeared that the remaining soil associated with elevated gross gamma readings was limited to a relatively deep seam of soil (at depth of approximately 8 to 10 feet bgs) which possibly continued to the south and to greater depth. Because elevated gross gamma readings remained, orange construction fencing was laid over the bottom of the excavation to provide a demarcation of the final extent of excavation (see Photograph 15).

Excavation activities were completed on August 3, 2012. Excavated materials were transported by truck to a staging area at 650 East Gilbert Street, Wichita, Kansas, the location of another EPA-led removal action involving radium contamination. At this location, the material was staged, then loaded onto rail cars, and transported by rail to the EnergySolutions disposal facility near Clive, Utah.

3.2 AIR MONITORING

During the excavation activities, EPA and START conducted air monitoring to measure airborne concentrations of radioactive material using RADeCO® Model H-810 high-volume air samplers and a Ludlum® Model 3030 Alpha/Beta Sample Counter. Air samplers positioned near excavation activities ran continuously during those activities. Paper filter samples were collected each day from the samplers and analyzed for radiological contamination by START and EPA using the Ludlum® Model 3030 Alpha/Beta Sample Counter. Based on the measurements obtained from the filter samples, exposure rates did not exceed applicable health-based action levels.

3.3 SITE RESTORATION

The excavated areas were backfilled with soil. START screened the backfill material for gross gamma activity with the Ludlum 44-10 NaI detector and obtained readings consistent with background activity. A sample was collected from the soil backfill and submitted to TestAmerica in Earth City, Missouri, for analyses for VOCs via EPA Method 8260B, semivolatile organic compounds via EPA Method 8270C, Resource Conservation and Recovery Act metals via EPA Methods 6010B and 7471A, and radionuclides via gamma spectroscopy. No analyte concentration in the soil sample exceeded the most stringent KDHE Tier 2 risk-based cleanup values for residential scenarios established in *Risk-Based Standards for Kansas RSK Manual – 5th Version* (KDHE 2010). A summary of the analytical data is in Appendix D – Table D-1. The complete analytical laboratory report is in Appendix F.

3.4 POST-EXCAVATION GAMMA SURVEY

On November 7, 2012, a post-excavation gamma survey occurred using a Ludlum Model 44-20 NaI scintillation detector and the Rapid Assessment Tool Software (RATS) system to obtain the survey data. RATS is a software program developed by the EPA Region 5 Field Environmental Decision Support (FIELDS) Team that integrates real-time data from global positioning system (GPS) software and environmental monitoring devices. RATS stores the sample data with the GPS locations in a file and plots the results on a dynamic, two-dimensional display in real time. To conduct the survey, the surveyor walked over the excavated areas in a forward direction at 1 to 2 feet per second while swinging the detector back and forth, and holding the detector approximately 6 inches above the ground, thus generally covering a serpentine pattern over the ground surface. Figure 6 in Appendix A presents the post-excavation gamma survey results.

4.0 FINAL STATUS SURVEY

A final status survey (FSS) is performed to demonstrate that residual radioactivity in a specified area satisfies predetermined criteria for release for unrestricted use, or where appropriate, for use with designated limitations. EPA has established a time-critical RA level for radium-226 of 5 pCi/g above background in surface soil (Tetra Tech 2012). This time-critical RA level was based on surface soil cleanup standards developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978, as specified in 40 *Code of Federal Regulations* (CFR) Part 192. Note that evaluation of subsurface contamination is outside the scope of MARSSIM. Data obtained during the RA pertaining to subsurface conditions is discussed in Section 5.0.

4.1 DERIVED CONCENTRATION GUIDELINE LEVELS

The FSS provides data to compare to derived concentration guideline levels (DCGL). The DCGLs are radionuclide-specific concentrations derived from the criterion for release of the site for unrestricted use (referred throughout as "release criterion"). MARSSIM defines two categories of DCGLs based on the area of contamination. If the residual radioactivity is evenly distributed over a large area, MARSSIM looks at the average activity over the entire area. This DCGL—called the $DCGL_w$— is derived based on an average concentration over a large area (or "wide" area), and is used in the statistical tests described in MARSSIM. Conversely, if the residual radioactivity appears as small areas of elevated activity (i.e., hot spots) within a larger area, MARSSIM considers the results of individual measurements. This DCGL—called the $DCGL_{EMC}$—is defined as the DCGL used for the elevated measurement comparison (EMC). Typically, specific $DCGL_{EMC}$ values are derived using site-specific parameters for the specific area of concern. MARSSIM describes an elementary relationship between the DCGLs: the $DCGL_{EMC}$ equals the $DCGL_w$ times an area factor. The area factor is the magnitude by which the concentration within a small area of elevated activity (i.e., a hot spot) can exceed the $DCGL_W$ while maintaining compliance with the release criterion.

4.2 SURVEY DESIGN

This section summarizes the survey design parameters defined in the *Final Status Survey Sampling Design Plan* developed for the site and included in the Quality Assurance Project Plan (QAPP) (Tetra Tech 2012), and describes deviations from the QAPP.

Residual Radioactivity Limits

The survey was designed to provide post-excavation data to demonstrate that all radiological parameters do not exceed the established $DCGL_W$ plus background. The $DCGL_W$ at the site was 5 pCi/g for radium-226 in surface soil. Again, under MARSSIM, the $DCGL_W$ refers to the level of radioactivity above appropriate background levels; therefore, the numerical value of the $DCGL_W$ does not include background activity (EPA 2000). Although the survey was designed to provide data that could be compared directly to the $DCGL_W$, an alternative method of comparison—the "elevated measurement comparison" (which uses $DCGL_{EMC}$ values derived from $DCGL_W$ values)—was considered a more relevant method of comparison for areas of the site where relatively small excavation areas resulted from the cleanup. This consideration is discussed further in Section 4.4.

Survey Units

Based on the results of real-time surveying before and during the excavation activities, six discrete areas were classified as Class 1 survey units. This RA included excavation of contaminated material within those survey units. In addition, the unexcavated surface immediately surrounding each excavation was treated as a Class 3 survey unit.

During the RA, six Class 1 survey units were designated:

- **Area 1 Class 1 Survey Unit** – An approximately 20-square-foot area at the northwest corner of the property where radium-impacted soil was identified and removed.
- **Area 2 Class 1 Survey Unit** – Approximately 130 square feet that included the interior area in the 4105 West Pawnee building where concrete flooring and radium-impacted sand and soil were removed. Also, this survey unit included the exterior area trench dug to remove the waste pipe run.
- **Area 3 & 4 Class 1 Survey Unit** – An approximately 500-square-foot exterior area south of the detached garage where radium-impacted soil was identified and removed.
- **Area 5 Class 1 Survey Unit** – An approximately 13-square-foot area in the south-central portion of the property where radium-impacted soil was identified and removed.
- **Area 6 Class 1 Survey Unit** – Approximately 360 square feet of excavated areas along the south-central edge of the property boundary.
- **Area 7 Class 1 Survey Unit** – Approximately 108 square feet of soil exposed during the sump excavation—from ground surface to 2 feet bgs. Because MARSSIM does not address subsurface contamination, data associated with soil deeper than 2 feet bgs are not evaluated using MARSSIM; but data regarding this soil are discussed in Section 5.0.

The ground surface immediately surrounding the Class 1 survey units was treated as a Class 3 survey unit.

Survey Instrumentation and Survey Techniques

Real-time monitoring of surface soils for gross gamma activity occurred using a Ludlum Model 2241-3 digital survey meter with a Ludlum Model 44-10 NaI scintillation detector. Real-time surveys proceeded by scanning the surface soil in a serpentine pattern moving at approximately 1 to 2 feet per second, with the detector held approximately 6 inches above ground surface.

Reference Areas

Because radium-226 is naturally occurring, background concentrations were established by collecting background samples from a reference area. For this survey, seven background soil samples were used to evaluate background concentrations (see Appendix A, Figure 5).

Reference Coordinate System

Per MARSSIM guidance, if the survey unit area is relatively small (less than 100 square meters), the statistical tests prescribed in MARSSIM may suggest obtaining a number of data points that would be unnecessarily large and not appropriate for the size of the survey unit (EPA 2000). Because the excavated areas were relatively small (the largest survey unit, the Areas 3 & 4 Class 1 survey unit, was approximately 500 square feet [or 47 square meters]), the number of samples collected was based on judgment, rather than on statistical techniques presented in MARSSIM; therefore, a reference coordinate system was not needed to establish grid spacing. Descriptions of individual sample locations are documented in field notes (see Appendix C).

4.3 CONFIRMATION SAMPLING AND FINAL STATUS SURVEY

An FSS was conducted using MARSSIM guidance (EPA 2000) and the FSS sampling design plan developed in the QAPP (Tetra Tech 2012). The FSS included both a final real-time surface scanning survey and collection of soil samples for laboratory analysis. Because MARSSIM guidance largely pertains to surveys over wide areas (generally 100 square meters or larger), deviation from the design plan and statistical analysis of the data was necessary due to the relatively small size of the remediated areas. The cleanup resulted in excavation of multiple discrete areas of the property, the largest being approximately 500 square feet (approximately 47 square meters). Deviations from MARSSIM guidance and the FSS sampling design plan are described throughout this report.

The final surface scan occurred to verify that no unknown areas of elevated activity remained following excavation. MARSSIM requires a 100-percent scan of soils within Class 1 survey units and a "judgmental" scan within Class 3 survey units. For this site, a 100-percent surface scan of surface soils was conducted within the Class 1 survey units (i.e., the excavated areas) and within the Class 3 survey unit (the unexcavated area surrounding the Class 1 survey units). During the final surface soil scanning, no measurements exceeding approximately twice background were obtained, suggesting that no areas of significantly elevated activity remained.

Following the final surface scan, soil samples were collected for laboratory analysis. Because the sizes of the Class 1 survey units (the excavated areas) were relatively small (each area was less than 100 square meters), the number and locations of samples collected were based on professional judgment, rather than on statistical techniques presented in MARSSIM. Descriptions of individual sample locations are documented in field notes (see Appendix C).

At each sampling location, a soil sample was collected, packaged in a labeled Ziploc® bag, and placed in a cooler. The collected samples were shipped to TestAmerica in Earth City, Missouri, for analysis for radionuclides via gamma spectroscopy. Table D-2 in Appendix D presents results of analyses for all targeted radioactive elements, and Appendix E provides the laboratory analytical reports.

4.4 SURVEY RESULTS

The summary statistics of the radium-226 soil sample data from the Class 1 survey units and the reference area are listed in Table 1. The average measurement in the surface soil survey units ranged from 1.4 to 7.0 pCi/g, and in the reference area the average was 1.1 pCi/g. Review of the data shows that maximum survey measurements in the Area 2, Areas 3 & 4, Area 5, and Area 6 Class 1 survey units did not exceed the $DCGL_W$ (5 pCi/g) plus the average background (1.1 pCi/g)—indicating these survey units meet the release criterion. However, the maximum survey measurements in the Area 1 and Area 7 survey units exceeded the $DCGL_W$ (5 pCi/g) plus the average background (1.1 pCi/g); therefore, further comparison of the data to the release criterion, including the $DCGL_{EMC}$, is necessary.

TABLE 1

SUMMARY OF CLASS 1 SURVEY UNIT AND REFERENCE AREA DATA RADIATION – STANDARD PRECISION (FORMER), WICHITA, KANSAS

Survey Unit	Number of Measurements	Radium-226 Measurements (picoCuries per gram)		
		Minimum	Maximum	Average
Area 1	1	**7.0**	**7.0**	**7.0**
Area 2	14	0.356	4.79	1.4
Area 3 & 4	7	0.8	2.7	1.4
Area 5	1	1.55	1.55	1.55
Area 6	7	1.35	5.84	3.3
Area 7	15	0.473	**12.0**	2.9
Reference Area	7	0.69	1.5	1.1

Note:

Shaded values exceed the $DCGL_W$ (5.0 pCi/g) plus the average background radium-226 concentration (1.1 pCi/g)

4.5 STATISTICAL TESTS

MARSSIM describes use of statistical methods (such as the Wilcoxon Rank Sum test) for interpreting FSS data. These statistical methods are designed to detect whether or not activity in the survey unit exceeds the $DCGL_W$. Because the $DCGL_W$ is a guideline level intended for comparison to measurements from survey units of large areas of evenly distributed residual radioactivity, these statistical methods are less relevant to the Standard Precision FSS data (obtained from relatively small excavated areas) than are other methods of comparison. Therefore, a statistical test was not used to directly compare the Standard Precision FSS data to the $DCGL_W$.

4.6 ELEVATED MEASUREMENT COMPARISON

MARSSIM addresses the concern for small areas of elevated activity by using the "elevated measurement comparison"—an alternative to statistical methods whereby each survey measurement is compared to an investigation level called the $DCGL_{EMC}$. Typically, elevated measurements (i.e., measurements that exceed the $DCGL_W$) are deemed acceptable provided that the $DCGL_{EMC}$ is not exceeded. The $DCGL_{EMC}$ is the $DCGL_W$ modified to account for the reduction in dose (or risk) of smaller areas and is mathematically determined by multiplying the $DCGL_W$ by a correction factor called the area factor. The area factor is equal to the magnitude by which the concentration within the small area of elevated activity can exceed the $DCGL_W$ while maintaining compliance with the release criterion. Thus, area factors are specific to (1) the size of the elevated area of activity under evaluation, and (2) the underlying exposure assumptions used to determine the $DCGL_W$. MARSSIM states that this approach "is a defensible

modification because the exposure assumptions (e.g., exposure time and duration) are the same as those used to develop the $DCGL_W$" (EPA 2000).

MARSSIM provides an illustrative example for generating area factors for outdoor areas (see MARSSIM, Section 5.5.2.4). In the MARSSIM example, the guidance describes using modeling software to calculate dose rates for various smaller area sizes (e.g., 1, 3, 10, 30, 100, 300, 1,000, and 3,000 square meters [m^2]) and then dividing these resulting dose rates by the dose rate that corresponds to the "wide area" size used to calculated the $DCGL_W$ (10,000 m^2 in the example). These relative dose rates are the area factors. Thus, in this example, the area factor is equal the ratio of the smaller area dose rate to the dose rate of the larger area (the "wide area") used to determine the $DCGL_W$. Using this general approach, area factors were developed for the Standard Precision site via the following steps:

1. The external gamma exposure pathway was selected as the modeled pathway for calculating the area factors for the site; this approach involves specification of the $DCGL_W$ as 5 pCi/g because that was the surface soil cleanup criterion for radium-226 developed for cleanup of radiation-contaminated soil under the UMTRCA of 1978, as found in 40 CFR Part 192. According to a 1998 EPA memorandum, the purpose of this criterion was to limit the risk from inhalation of radon decay products in houses built on mine tailings, and to limit gamma radiation exposure to people using contaminated land (EPA 1998). This memorandum further explains that the concentration criterion for surface soil (5 pCi/g of radium-226) is a health-based standard and is based on exposure to gamma radiation. Because the $DCGL_W$ is based on the UMTRCA cleanup criterion of 5 pCi/g of radium-226, and this criterion is based on gamma radiation exposure, the external gamma exposure pathway is evaluated for the purpose of determining area factors.

2. Data for evaluating risks from external gamma radiation within areas of various sizes is obtained from the document *Ratios of Dose Rates for Contaminated Slabs* (Eckerman 2007). This document presents calculated ratios of dose rates from various radionuclides, including radium-226, for external gamma exposure over contaminated slabs of various sizes relative to the dose rate over a contaminated slab of infinite size (an infinite ground plane source). A copy of this document is in Appendix E. Ratios for the radionuclide "Ra-226+D" specified in the document constitute the basis for calculating the area factors, and are shown in the first column of Table E-1 in Appendix E. The "+D" notation indicates that the calculated ratios account for exposure to progeny (daughters) of radium-226. The ratios of dose rates from Eckerman are plotted in Figure E-1 of Appendix E, and a best-fit-line to the data within a region of interest allows interpretation of additional ratios for other slab sizes from the data.

3. As shown in Table E-1 in Appendix E, ratios of dose rates expressed in terms relative to an infinite ground source are converted to ratios relative to a 10,000 m^2 ground plane source. This size ground plane source (10,000 m^2) represents the size of the "wide area"—it was selected in absence of any specific assumptions known to establish the UMTRCA cleanup criterion, and because this slab size is commonly used as a default slab size in risk-based calculations (this is the slab size used in the MARSSIM example and is the default slab size used in EPA's calculator for preliminary remediation goals [PRG] for radionuclides [EPA 2013]).

4. The inverse of the dose ratios (relative to a 10,000 m^2 ground place source) are calculated, and these values equal the area factors corresponding to the various slab sizes (see fourth column of Table E-1 in Appendix E).

5. $DCGL_{EMC}$ values are calculated for the various slab sizes by multiplying the associated area factor by the $DCGL_W$ of 5.0 pCi/g (see fifth column of Table E-1 in Appendix E).

Table 2 lists $DCGL_{EMC}$ values calculated using the preceding steps for slab sizes between 3 and 10,000 m^2.

TABLE 2

SITE-SPECIFIC AREA FACTORS AND $DCGL_{EMC}$ VALUES
RADIATION – STANDARD PRECISION (FORMER), WICHITA, KANSAS

Slab Size (m^2)	Area Factor (unitless)	$DCGL_{EMC}$ (pCi/g)
3	10.2	51
10	4.06	20
20	3.15	15
50	2.17	11
100	1.81	9.0
500	1.34	6.7
1,000	1.22	6.1
2,000	1.13	5.7
5,000	1.05	5.2
10,000	1.00	5.0

Notes:

$DCGL_{EMC}$	Derived concentration guideline level for elevated measurement comparison
m^2	Square meter
pCi/g	picoCuries per gram

To conduct the elevated measurement comparison, a relevant $DCGL_{EMC}$ among those determined for various areas of elevated activity (i.e., for the various slab sizes) must be selected and then compared to the specific elevated measurement under evaluation. Table 3 shows the elevated measurement comparisons for the Area 1 and Area 7 survey units (the surface soil survey units with measurements exceeding the $DCGL_W$ plus the average background), and identifies the basis for selection of the relevant $DCGL_{EMC}$.

TABLE 3

ELEVATED MEASUREMENT COMPARISONS
RADIATION – STANDARD PRECISION (FORMER), WICHITA, KANSAS

Survey Unit	Area of Elevated Activity and Basis of Estimation	Elevated Radium-226 Measurement(s) (pCi/g)	Relevant $DCGL_{EMC}$ Selected from Table 2 (pCi/g)	Result of Comparison to Relevant $DCGL_{EMC}$
Area 1 (small discrete area at northwest corner of property)	No larger than the excavated area (a circular area approximately 5 feet in diameter), which corresponds to an area of approximately 20 ft^2 (or 1.8 m^2).	7.0	51	Elevated measurement associated with small area of activity does not exceed the relevant $DCGL_{EMC}$
Area 7 (near surface soil exposed by sump excavation)	No larger than the total area of a 2-foot-wide boundary surrounding the approximately 12- by 15-foot sump excavation[1], which corresponds to an area of approximately 124 ft^2 (or 11.5 m^2).	6.98 12.0	15	Elevated measurements associated with small area of activity do not exceed the relevant $DCGL_{EMC}$

Notes:

[1] The area of a 2-foot-wide zone surrounding the excavation can be expressed as an area with dimensions of 19 by 16 feet less the area of the actual excavation (15 by 12 feet). That is (19 feet)(16 feet) – (15 feet)(12 feet) = 124 ft^2.

$DCGL_{EMC}$	Derived concentration guideline level for elevated measurement comparison
ft^2	Square feet
m^2	Square meter
pCi/g	picoCuries per gram

Based on the above elevated measurement comparison, no measurements in the survey units exceed relevant $DCGL_{EMC}$ values, indicating the site is in compliance with the release criterion.

5.0 EVALUATION OF SUBSURFACE DATA

As described in Section 3.1, excavation of soil in the sump area discontinued when soil had been excavated to a maximum depth of approximately 10 feet bgs. Measurements with a Ludlum 44-10 detector indicated that some soil with elevated gross gamma readings remained in a relatively deep seam of soil along the south edge of the excavation (at depth of approximately 8 to 10 feet bgs), and possibly continued to the south and to greater depth. Before backfilling, several subsurface soil samples were collected from the sump excavation. Table 4 lists the radium-226 results from these soil samples.

TABLE 4

SUMMARY OF SUMP AREA SUBSURFACE SOIL RESULTS
RADIATION – STANDARD PRECISION (FORMER), WICHITA, KANSAS

Survey Unit	Approximate Depth (feet below ground surface)	Radium-226 Measurements (picoCuries per gram)
South 4	8-10	2.93
South 5	8-10	35.2
South 5 (laboratory duplicate)	8-10	34.8
West E	4	4.69
West F	4	1.12
East C	4	0.918
East D	4	2.51

One of the six subsurface samples exceeded a radium-226 measurement of 5 pCi/g—the EPA-established, time-critical RA level. However, this RA level is less relevant to subsurface soil concentrations because it is based on a surface soil cleanup criterion for radium-226 developed under the UMTRCA of 1978. As indicated in Section 4.6, the 5 pCi/g criterion is based on external gamma exposure from surface soil. Because soil and other dense materials attenuate gamma radiation, radiologically impacted soil is less likely to pose a risk of external gamma exposure if at a depth where it is less likely to be disturbed (and brought to the surface) and is shielded by overlying unimpacted soil. The post-excavation surface survey indicated gross gamma readings over the sump excavation area were consistent with background activity (see Appendix A, Figure 6).

EPA's *Soil Screening Guidance for Radionuclides,* indicates the only pathway typically of concern for radioactive contaminants in subsurface soil in a residential setting is migration of radionuclides to an underlying aquifer used as a drinking water source (EPA 2000b). This guidance further states that "consideration of the groundwater pathway may be eliminated if groundwater beneath or adjacent to the site is not a potential source of drinking water" (EPA 2000b). Groundwater beneath or adjacent to the Standard Precision facility is not likely a potential source of drinking water because the City of Wichita provides municipal water service in the area of the facility. Moreover, previous groundwater sampling indicated that radium-226 in groundwater is not likely migrating off the Standard Precision property at concentrations of concern (Tetra Tech 2011). This conclusion is supported by data from two groundwater samples collected in November 2010 approximately 60 feet south and downgradient of the abandoned sump along the south property line. These samples contained chlorinated VOC contaminants (likely from

the abandoned sump), but did not contain radium-226 concentration above the maximum contaminant level (MCL) of 5 pCi/L (Tetra Tech 2011).

Overall, although some subsurface soil with radium-226 concentrations exceeding the EPA-established RA level of 5 pCi/g above background (an RA level based on surface soil cleanup criterion from UMTRCA), its extent and depth reduce the likelihood of external gamma exposure. Moreover, previous groundwater sampling indicates that radium-226 is not likely migrating off the Standard Precision property at concentrations of concern.

6.0 SUMMARY

START was tasked by EPA to conduct RA support activities at the Standard Precision site in Wichita, Kansas. The site was the location of the Standard Precision, Inc., facility that was granted a radioactive material license and operated until approximately 1968 (KDHE 2007). Based on information obtained during previous investigations, EPA determined that radium-226 was present in soils at levels that posed an imminent threat to human populations, thereby warranting a time-critical RA. RA activities included excavation and off-site disposal of radium-226 impacted material, acquisition of real-time monitoring data, and completion of an FSS in accordance with MARSSIM to determine if survey units could be released for unrestricted use.

Removal activities for this site were conducted in July and August 2012, and a surface gamma survey occurred in November 2012 following completion of restoration activities. During the excavation, surface soils were continually scanned by START for gross gamma activity. Post-excavation soil samples were collected and submitted to TestAmerica for analysis via gamma spectroscopy. Laboratory analysis of the soil samples indicated several radium-226 measurements in surface soil that exceeded the $DCGL_W$ (5 pCi/g) plus the average background (1.1 pCi/g). Therefore, further comparison of the data to the release criterion was necessary. During evaluation of the FSS data, a primary consideration was the relatively small size of the excavated areas. MARSSIM addresses the concern for small areas of elevated activity by using the "elevated measurement comparison"—an alternative to statistical methods whereby each survey measurement is compared to an investigation level called the $DCGL_{EMC}$. Typically, elevated measurements that exceed the $DCGL_W$ are deemed acceptable provided that the $DCGL_{EMC}$ is not exceeded. Therefore, evaluation of the survey data included deriving $DCGL_{EMC}$ values and comparing these values to the survey data. This comparison showed that no surface soil survey unit measurements exceeded relevant $DCGL_{EMC}$ values, indicating that the release criterion had been met. On this basis, the

FSS data and results of the elevated measurement comparison indicate that the surface soil at the site should be released for unrestricted use.

Subsurface contamination is outside the scope of MARSSIM; therefore, an alternative analysis occurred to evaluate data from subsurface soils samples collected from the sump area excavation. EPA's *Soil Screening Guidance for Radionuclides,* indicates the only pathway typically of concern for radioactive contaminants in subsurface soil in a residential setting is migration of radionuclides to an underlying aquifer used as a drinking water source (EPA 2000b). Considering this soil to groundwater pathway, it was noted that groundwater beneath or adjacent to the Standard Precision facility is not likely a potential source of drinking water (the City of Wichita provides municipal water service in the area of the facility), and moreover, that previous groundwater sampling had shown no indication that radium-226 in groundwater was migrating off the Standard Precision property at concentrations of concern (Tetra Tech 2011). Overall, although some subsurface soil associated with the former sump remains with radium-226 concentrations exceeding the EPA-established RA level of 5 pCi/g above background (an RA level based on surface soil cleanup criterion from UMTRCA), this soil is less likely to pose a health risk of significant concern because exposure to gamma radiation is mitigated by the depth of soil with elevated radium-226 concentrations and because the soil to groundwater pathway does not appear to be complete.

7.0 REFERENCES

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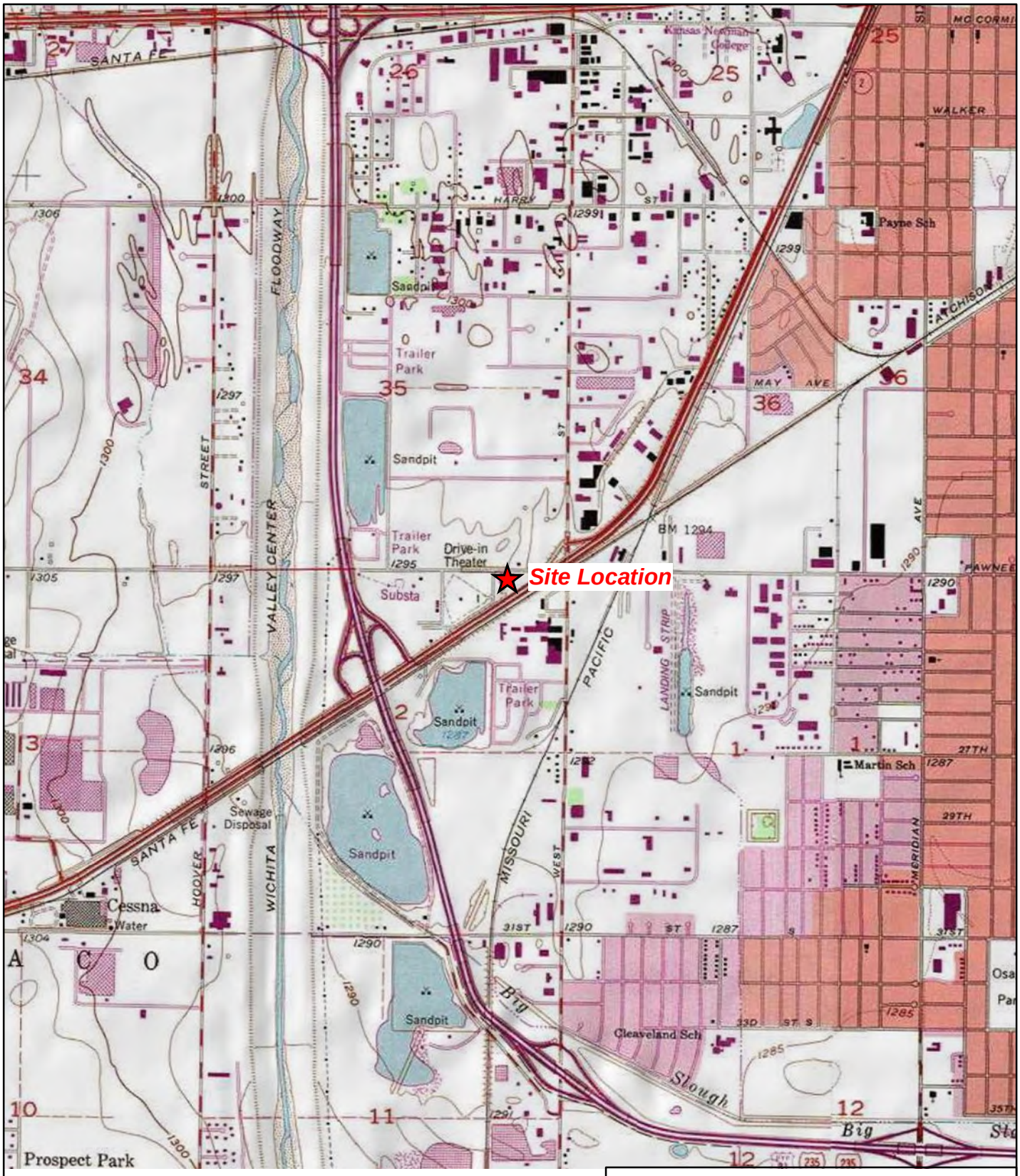
APPENDIX A

FIGURES



Source: USGS Wichita East, Kansas 7.5 Minute Topo Quad, 1982
USGS Wichita West, Kansas 7.5 Minute Topo Quad, 1982

Radiation - Standard Precision, Inc. (Former)
Wichita, Kansas

Figure 1

Site Location Map

TETRA TECH

Date: 03/15/2013 Drawn By: Nick Wiederholt Project No: X9004.L.12.0303.000

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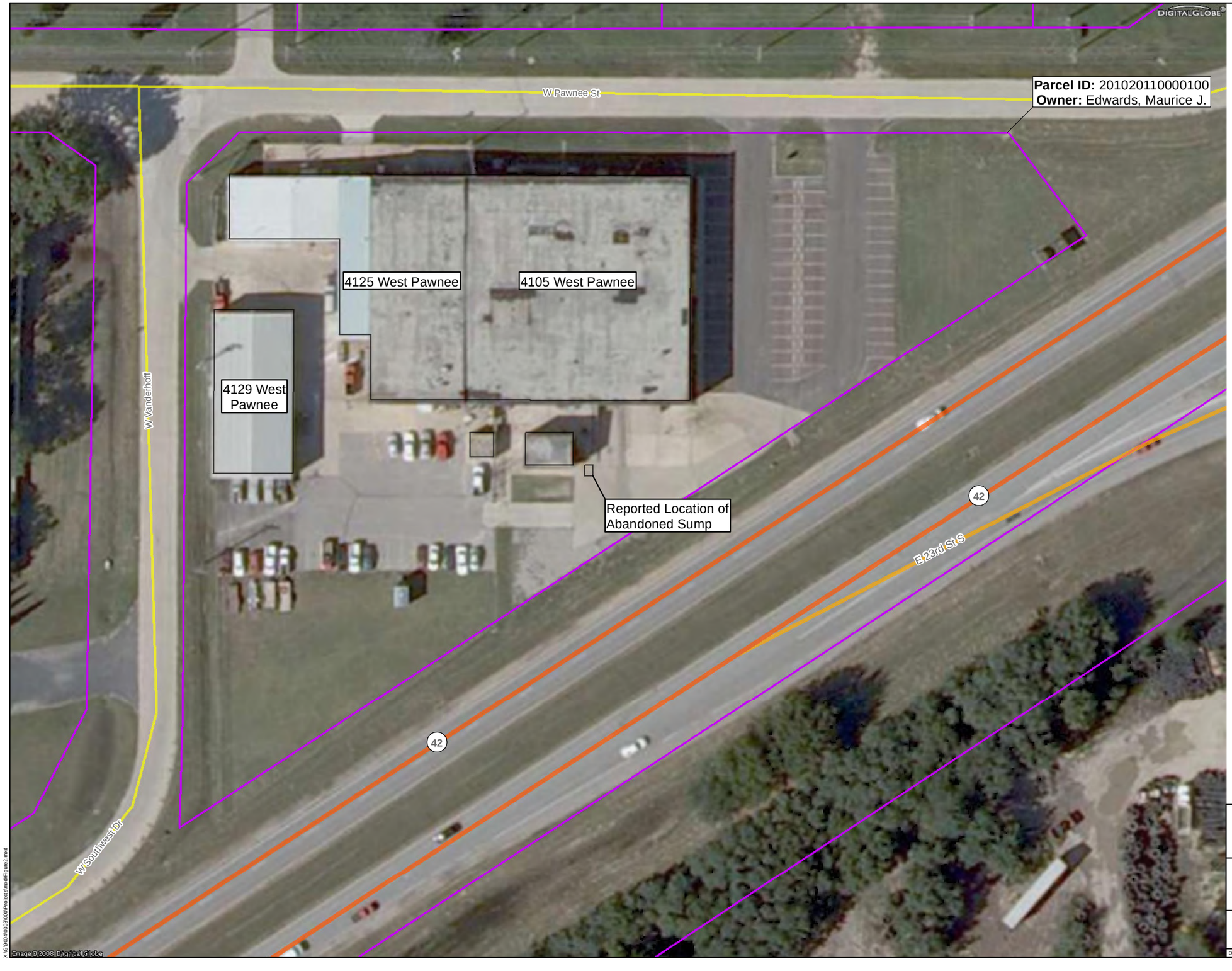

Legend

- State Highway
- Major Road
- Street
- Structure
- Parcel Boundary

N

30 0 30

Feet

Source: GlobeXplorer Aerial Imagery, DigitalGlobe, 2008;
Sedgwick County GIS, Property Parcels, 2010;
Sedgwick County, Real Property Appraisal/Tax Information, 2010;
HSIP Gold, 2007.

Radiation - Standard Precision, Inc. (Former)
Wichita, Kansas

Figure 2

Site Layout Map

TETRA TECH

Date: 03/26/13 Drawn By: Nick Wiederholt Project No: X9004.L.12.0303.000

X:\G\9004\0303\000\Projects\mxd\Figure2.mxd

Legend

Gamma Survey Location

- < 21,427 cpm
  Below Investigation Level
- 21,427 - 42,854 cpm
  Investigation Level to 2x Background
- 42,854 - 57,139 cpm
  2x Background to 3x Background
- 57,139 - 71,423 cpm
  3x Background to 4x Background
- > 71,423 cpm
  > 4x Background

State Highway

Major Road

Street

Parcel Boundary

cpm Counts Per Minute

Notes: Measurements were collected using a Ludlum 3x3 detector.

The Investigation Level is the mean of background readings plus 10 times the standard deviation of the background readings. Areas that exhibited gamma activity above the Investigation Level were subjected to additional investigation following the initial surface soil gamma survey.

N

30 0 30

Feet

Source: RAT System Survey, March 2009;
GlobeXplorer Aerial Imagery, DigitalGlobe, 2008;
Sedgwick County GIS, Property Parcels, 2010;
Sedgwick County, Real Property Appraisal/Tax Information, 2010;
HSIP Gold, 2007.

Radiation - Standard Precision, Inc. (Former)
Wichita, Kansas

Figure 3
Pre-Removal (March 2009)
Gamma Survey Results Map

TETRA TECH

Date: 03/15/13 Drawn By: Nick Wiederholt Project No: X9004.L.12.0303.000

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4105 West Pawnee

Personnel Door

Interior Excavation

Dock Door

Waste Pipe (Removed)

Loading Dock Ramp

Area 2 Excavation

Detached Garage

Parking Area

Areas 3 and 4 Excavation

Concrete Paving

Fence

Grassy Area

Sump Excavation

Sump (Removed)

Area 5 Excavation

Grassy Area

Area 6 Excavations

42

Legend

Fence

Excavated area

Grassy area

N

10 0 10

Feet

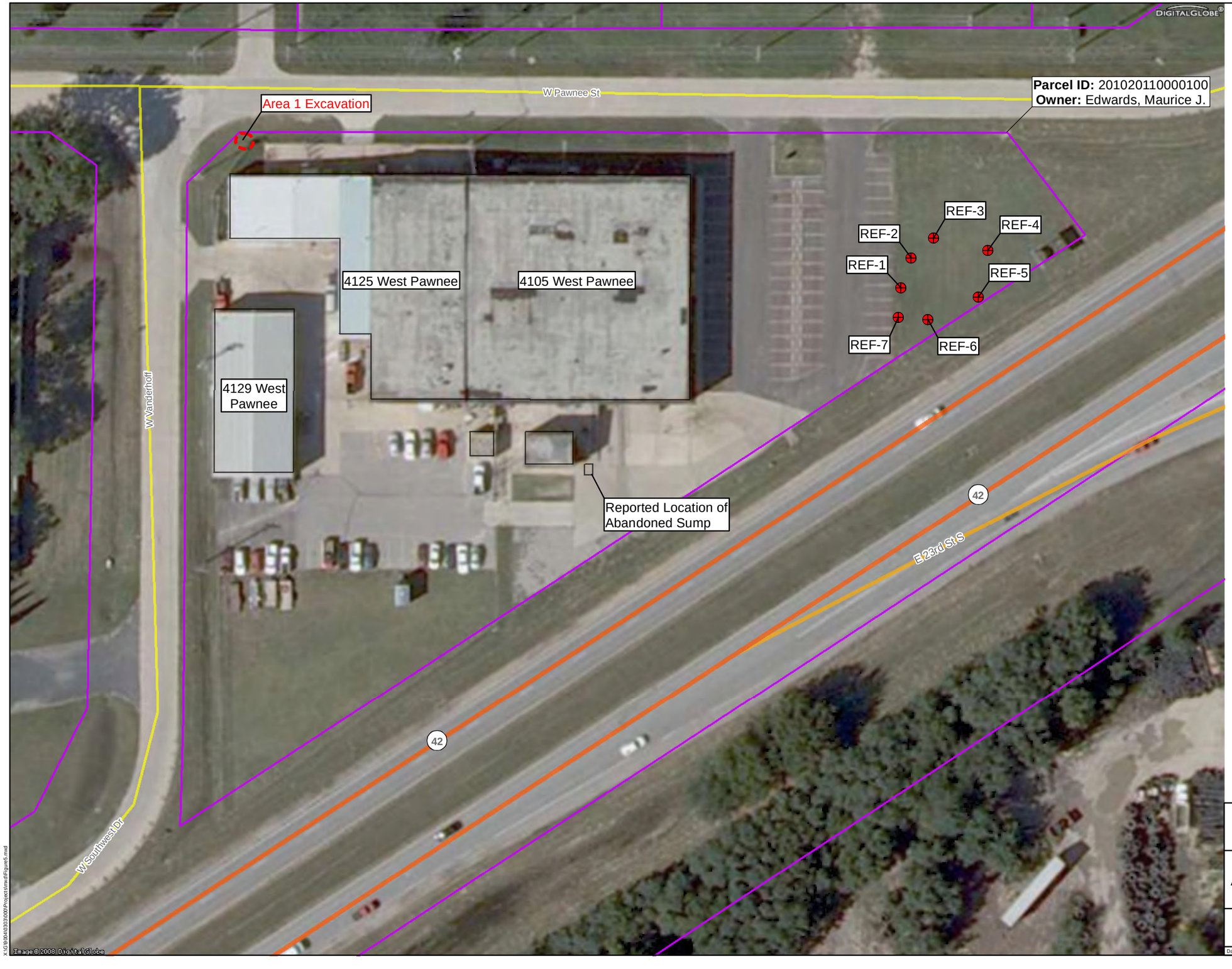
Radiation - Standard Precision, Inc. (Former)
Wichita, Kansas

Figure 4
Areas 2 through 6 and
Sump Excavation Areas

TETRA TECH

Date: 03/26/13 Drawn By: Nick Wiederholt Project No: X9004.L.12.0303.000

X:\G\9004\0303\000\Projects\mxd\Figure4.mxd



Legend

- Reference area soil sample
- State Highway
- Major Road
- Street
- Excavated area
- Parcel Boundary
- Structure

N

30 0 30

Feet

Source: GlobeXplorer Aerial Imagery, DigitalGlobe, 2008;
Sedgwick County GIS, Property Parcels, 2010;
Sedgwick County, Real Property Appraisal/Tax Information, 2010;
HSIP Gold, 2007.

Radiation - Standard Precision, Inc. (Former)
Wichita, Kansas

Figure 5
Area 1 Excavation and Reference Area Soil Sample Locations

TETRA TECH

Date: 03/26/13 Drawn By: Nick Wiederholt Project No: X9004.L.12.0303.000

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Legend

Gamma Survey Location

- < 43,725 cpm
  Below Investigation Level
- 43,725 - 44,304 cpm
  Investigation Level to 2x Background
- 44,304 - 66,456 cpm
  2x Background to 3x Background
- 66,456 - 88,608 cpm
  3x Background to 4x Background
- > 88,608 cpm
  > 4x Background
- State Highway
- Major Road
- Street
- Parcel Boundary
- cpm Counts Per Minute

Notes: Measurements were collected using a Ludlum 3x3 detector.

The Investigation Level is the mean of background readings plus 10 times the standard deviation of the background readings. Areas that exhibited gamma activity above the Investigation Level were subjected to additional investigation following the initial surface soil gamma survey.

N

30 0 30

Feet

Source: RAT System Survey, November 2012;
GlobeXplorer Aerial Imagery, DigitalGlobe, 2008;
Sedgwick County GIS, Property Parcels, 2010;
Sedgwick County, Real Property Appraisal/Tax Information, 2010;
HSIP Gold, 2007.

Radiation - Standard Precision, Inc. (Former)
Wichita, Kansas

Figure 6
Post-Removal (November 2012)
Gamma Survey Results Map

TETRA TECH

Date: 03/26/13 Drawn By: Nick Wiederholt Project No: X9004.L.12.0303.000

X:\G\9004\0303\000\Projects\mxd\Figure6.mxd

APPENDIX B

PHOTOGRAPHIC RECORD

Radiation – Standard Precision, Inc. (Former)
Wichita, Kansas

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows the interior excavation of Area 2 that occurred in the 4105 West Pawnee manufacturing building near the loading dock.	1
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: South	PHOTOGRAPHER	Robert Monnig	7/30/12

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows where the removed waste pipe had exited the building in Area 2.	2
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: South-southeast	PHOTOGRAPHER	Robert Monnig	7/30/12

Radiation – Standard Precision, Inc. (Former)
Wichita, Kansas

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows the interior excavation of Area 2.	3
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: East	PHOTOGRAPHER	Robert Monnig	7/30/12

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows an excavation associated with Area 6 (in foreground). The sump area excavation off the corner of the detached garage can be seen in the background.	4
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: Northwest	PHOTOGRAPHER	Robert Monnig	8/2/12

Radiation – Standard Precision, Inc. (Former)
Wichita, Kansas

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows excavated areas associated with Area 6.	5
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: North	PHOTOGRAPHER	Robert Monnig	8/2/12

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows backfilling of the sump area excavation.	6
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: West	PHOTOGRAPHER	Robert Monnig	8/2/12

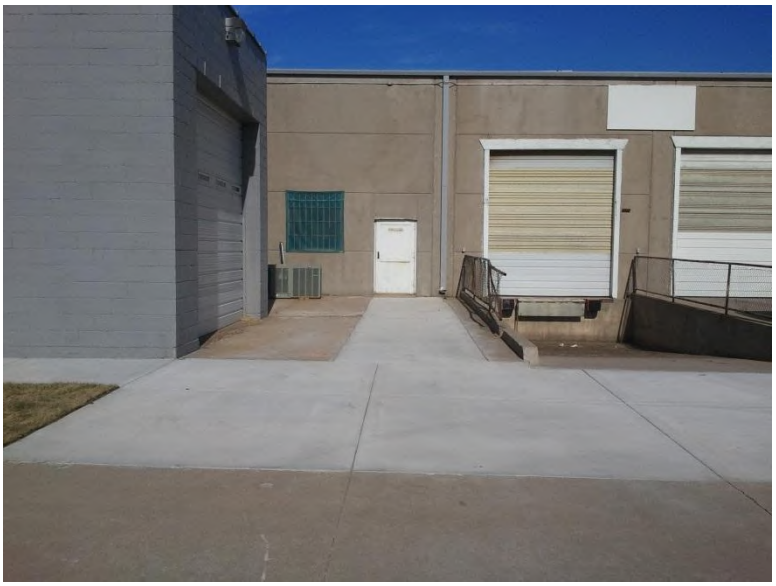
Radiation – Standard Precision, Inc. (Former)
Wichita, Kansas

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows the Area 3 & 4 excavation that abuts the south wall of the detached garage.	7
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: Northeast	PHOTOGRAPHER	Robert Monnig	8/3/12

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows the exterior portion of the Area 2 excavation where the waste pipe run was removed.	8
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: South	PHOTOGRAPHER	Robert Monnig	8/3/12

Radiation – Standard Precision, Inc. (Former)
Wichita, Kansas

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows the restored condition of the sump excavation area.	9
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: Northwest	PHOTOGRAPHER	Robert Monnig	11/7/12



TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows the restored condition of the sump and Area 2 excavation areas.	10
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: North	PHOTOGRAPHER	Robert Monnig	3/17/12

Radiation – Standard Precision, Inc. (Former)
Wichita, Kansas

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows the restored condition of the Area 3 and 4 excavation area.	11
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: Northwest	PHOTOGRAPHER	Robert Monnig	11/7/12

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows the restored condition of the Area 5 excavation area.	12
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: Southwest	PHOTOGRAPHER	Robert Monnig	11/7/12

Radiation – Standard Precision, Inc. (Former)
Wichita, Kansas

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows the restored condition of the Area 6 excavation area.	13
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: Southeast	PHOTOGRAPHER	Robert Monnig	11/7/12

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows the restored condition of the Area 1 excavation area.	14
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: West	PHOTOGRAPHER	Robert Monnig	11/7/12

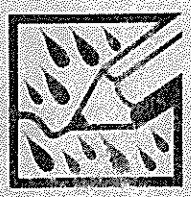
Radiation – Standard Precision, Inc. (Former)
Wichita, Kansas

TETRA TECH PROJECT NO. X9004.12.0303.000	DESCRIPTION	This photograph shows the orange construction fencing that was placed across the bottom of the sump area excavation prior to backfilling.	15
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: East	PHOTOGRAPHER	Megan Schuette	8/2/12

APPENDIX C

FIELD NOTES

KS1283



Rite in the Rain.

ALL-WEATHER

LEVEL

No. 71

Standard Precision

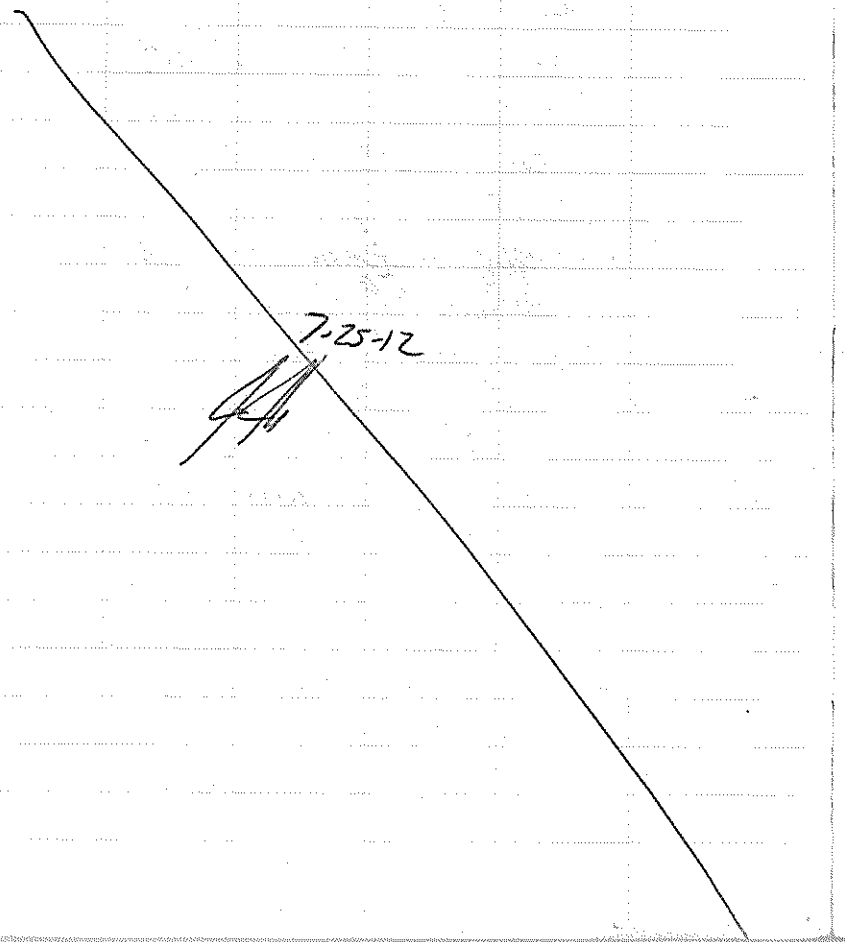
Removal

2

7-25-12

1430 STM Heft. + OSC **Schuette arrive on-site. Will debrief excavation area.** Chuck Jackson with ER will be on site shortly.

1611 Depart site, return to Standard Products



3

7-26-12

0756 STM Heflin & OSC Schuette arrive on-site, Cutting of concrete by ER will begin this morning.

0830 ER on-site, begin prep for cutting/excavation activities

0855 Start interior Radeco #632 2.7 CFM

0857 Start exterior Radeco #631 2.8 CFM

0920 ER begins cutting pipe run to tank ~~concrete~~

1200 Lunch

1230 Resume monitoring of site activities. ER is continuing to cut through concrete along pipe run.

1632 Shut down interior Radeco #632 Total volume: 1,128 ft.^{3}

1635 Shut down exterior radeco #631 total volume: ~~1,173~~ 1,235 ft.^{3}

1652 Depart site, en route to hotel.

1712 Arrive @ hotel, process samples taken at Standard Products for delivery to lab.

1800 Drop samples off at ~~lab~~ FedEx SH, end of day.

7-26-12

7-27-12

0655 STM, Heflin arrives @ Standard Packets site.

0700 ER performs daily safety meeting. Weather today: Sunny hi ~ 104°F

0750 Arrive @ Standard Precision site begin prep for site activities.

0825 Start Interior Radeco #631 2.4 CFM

0828 Start exterior Radeco #632 2.6 CFM

0832 ER begins work to remove concrete from pipe run

1138 Cutting saw malfunction will take lunch now to get in fixed.

1139 Shut down interior Radeco 450.0 ft³ #631

1141 Shut down exterior Radeco #632 502.2 ft³

1200 lunch

1230 Restart interior Radeco #631 2.5 CFM

1232 Restart exterior Radeco #632 2.6 CFM

1240 Rob Manning onsite.

1400 Crew has been cutting concrete. Crew says they are finished with

7/27/12 Standard Precision

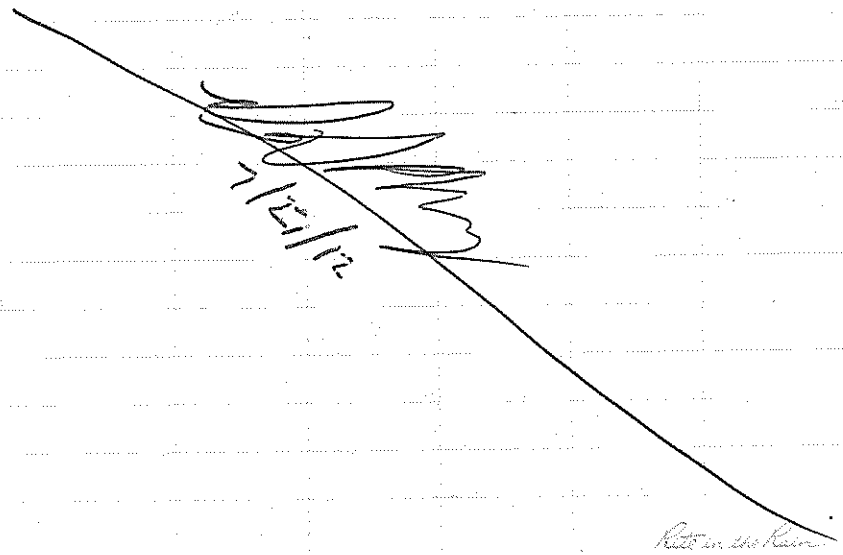
the concrete saw. RM Manning screens the saw blade with the alpha probe. Reading are consistent with background.

1415 Restarted exterior Radeco #632. Volume was 171.3 ft³

1551 The hydraulic line on the hammer has broken.

1552 Stop interior Radeco #631 Volume = 307.9 ft³.
Stop exterior Radeco #632. Volume = 224.8 ft³.

1610 Leave site.

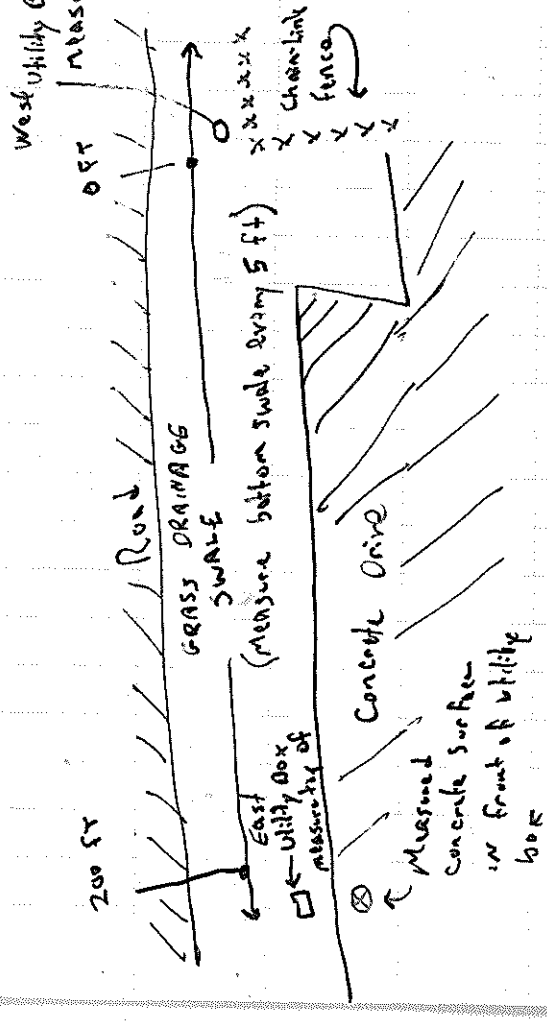


7/30/12

~~7/28/12~~ RM Standard Precision

0800 Rob Manning arrives at Standard Precision.

0830 Rob Manning and Megan Schutte ~~surf~~ RM survey the drainage swale on the south side of the Standard Precision facility. Measurements are taken from the bottom of the swale



SURVEY OF DRAINAGE SWALE (METERS)

STATION	BS	HI	FS	ELEV
~~0 ft~~ ~~21.58~~				
~~Top of Utility Box~~		~~24.85~~ RM	~~24.85~~	
~~5 ft~~				
0 ft	7.69	107.69	100.00	100.00
Utility Box, Top of (west box)			4.29	
5 ft	~~7.40~~ RM		7.40	
10 ft			7.39	
15 ft			7.39	
20 ft			7.39	
25 ft			7.28	
30 ft			7.23	
35 ft			6.93	
40 ft			7.30	
45 ft			7.15	
50 ft			7.30	
55 ft			6.80	
60 ft			7.03	
65 ft			7.01	
70 ft			6.53	
75 ft			6.39	
80 ft			6.18	
85 ft			6.05	
90 ft			5.93	

STATION	BS	HI	FS	ELEV
95 ft		107.69	5.86	
100 ft			5.91	
105 ft			5.87	
110 ft			5.87	
115 ft			5.94	
120 ft			5.88	
125 ft			5.90	
130 ft			5.91	
135 ft			5.88	
140 ft			5.81	
145 ft			5.81	
150 ft			5.68	
155 ft			5.57	
160 ft			5.61	
165 ft			5.65	
170 ft			5.77	
175 ft			5.85	
180 ft			5.87	
185 ft			5.77	
190 ft			5.84	
195 ft			5.87	
200 ft			5.79	
utility box (East)			2.40	
Concrete in front of utility box			5.22	

Station

garage (surface of concrete floor, just inside west dock door) 4.02

1000 ER has been breaking concrete and is beginning to excavate.

1015 Start Radecos. Inside Radeco is #632. #631 is outside Radeco.

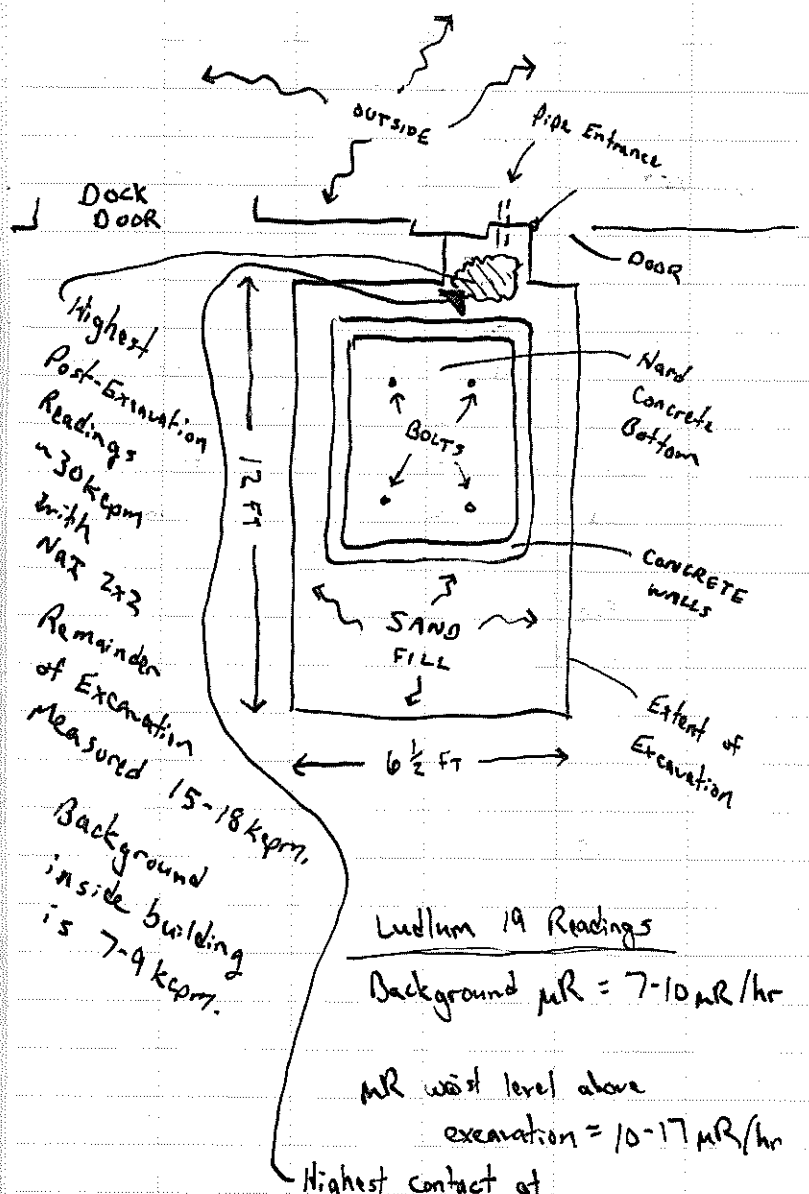
1200 A structure of concrete is encounted at excavation inside building. Goto lunch.

1305 Back from lunch and checking on standard products.

1406 ER has excavated area inside building. (see next page for diagram and real-time readings).

1712 ER has been excavating the sump area outside of the building. A remnant concrete tank- probably a septic tank- was un-earthed. Readings up to 0.5 mR/hr were measured with the Ludlum Model 19. Excavated soil appears discolored (light gray) and

Rain in the Rain



Ludlum 19 Readings

Background μR = 7-10 μR/hr

μR waist level above excavation = 10-17 μR/hr

Highest contact at south end = 33 μR/hr

7/30/12 Standard Precision.

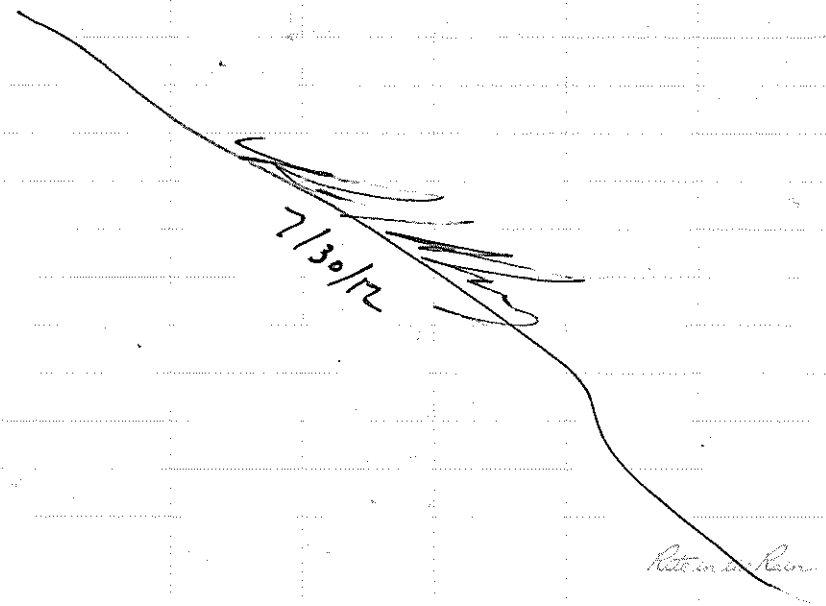
has a strong solvent odor. Air space in pit measures 25-300 ppb with ppbRAE. Collected "Sump Grab" sample. Headspace & sample measured 324 ppm.

1717 Collect Radeco #631 (outside) 835.2 ft³.

1720 Collect Radeco #632 (indoor) 392.1 ft³.

1721 End of day check of Unit #648 with NaI 2x2 probe. Check source reads 208 kcpm. Accepted reading is 209 kcpm. Unit has been reading correctly.

1739 Leave site.



7/31/12 Standard Precision

0740 Rob Monnig arrives onsite from Standard Products.

0800 Start Radecos. #631 is on east side of sump and #632 is on west.

0808 Check Unit #648 NaI ZnT probe. Check source = 205 kcpm. Unit is ok.

0917 Restart #631 Radeco. Vol=187.2.

1024 ER continues to excavate the sump location.

1150 Roy Krueger (EPA) comes to site to conduct a health and safety audit.

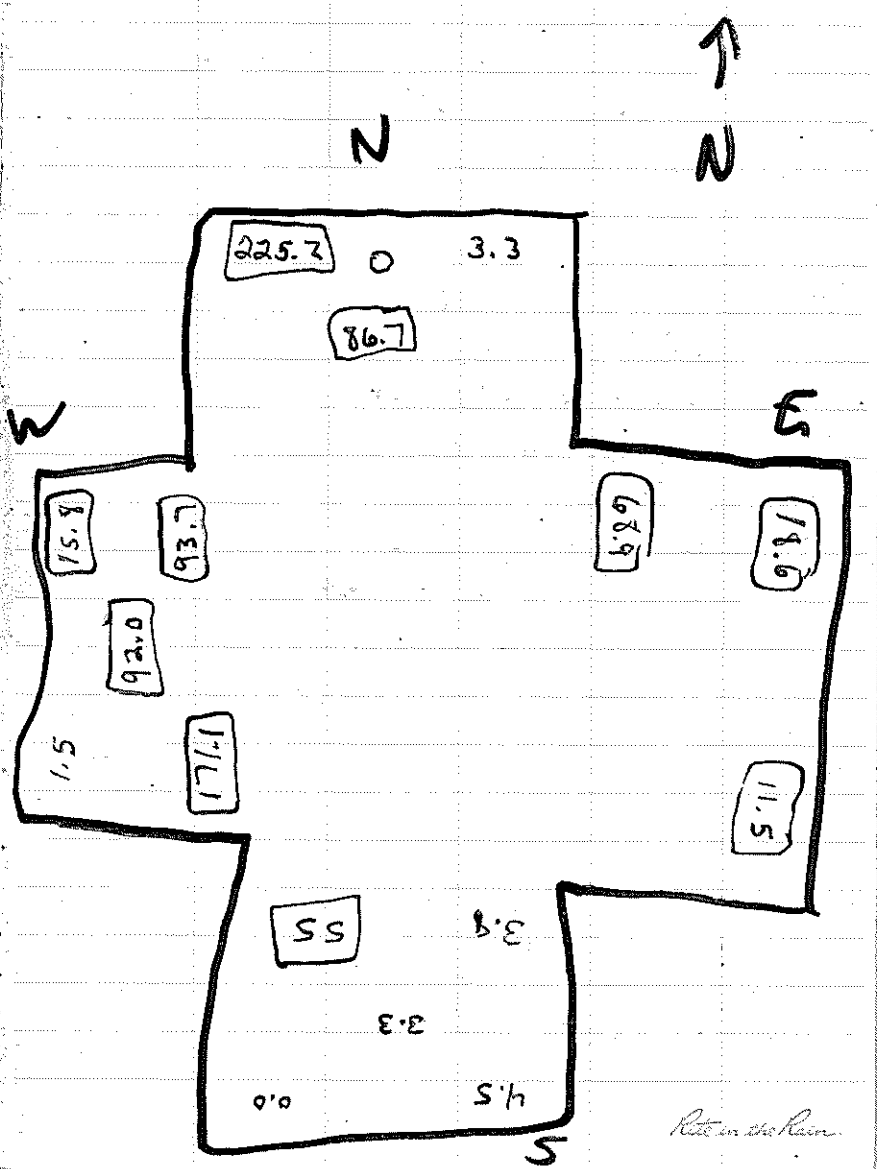
1230 Go to lunch.

1300 Back from lunch. ER continues to excavate the sump area.

1722 Stop Radecos, #631 = 1166.4 ft³. #632 = 158.0 ft³.

1738 Leave site

7/31/12

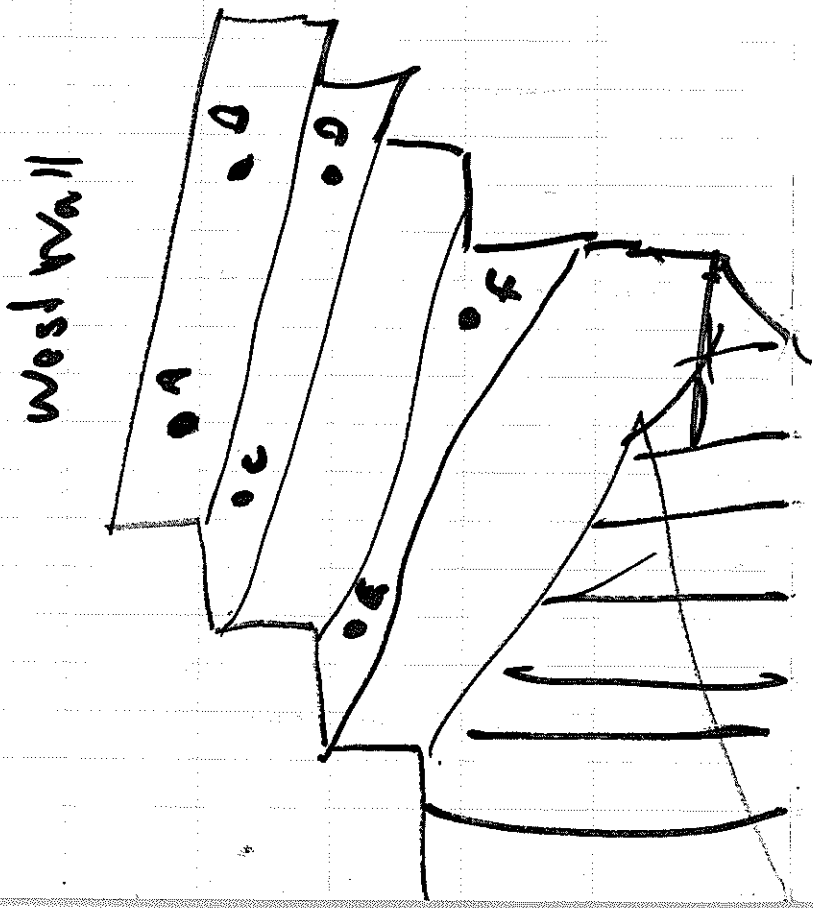


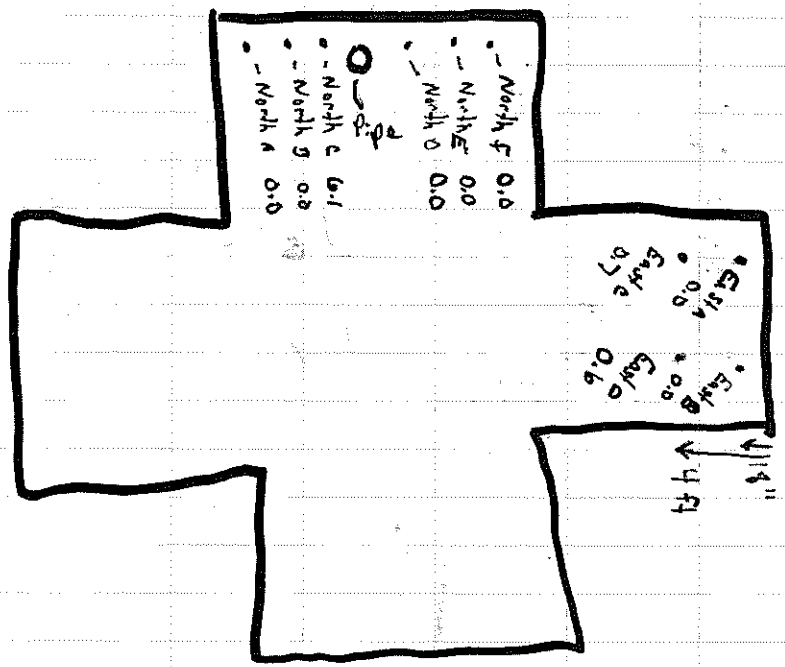
8/1/12 Standard Precision

0900 Arrive onsite from tailgate (7 AM) meeting at Standard Precision.

1200 Go to lunch. ER has been excavating more soil from the sump area. Rob Manning collected screening samples from the west and north walls.

1245 Back from lunch.

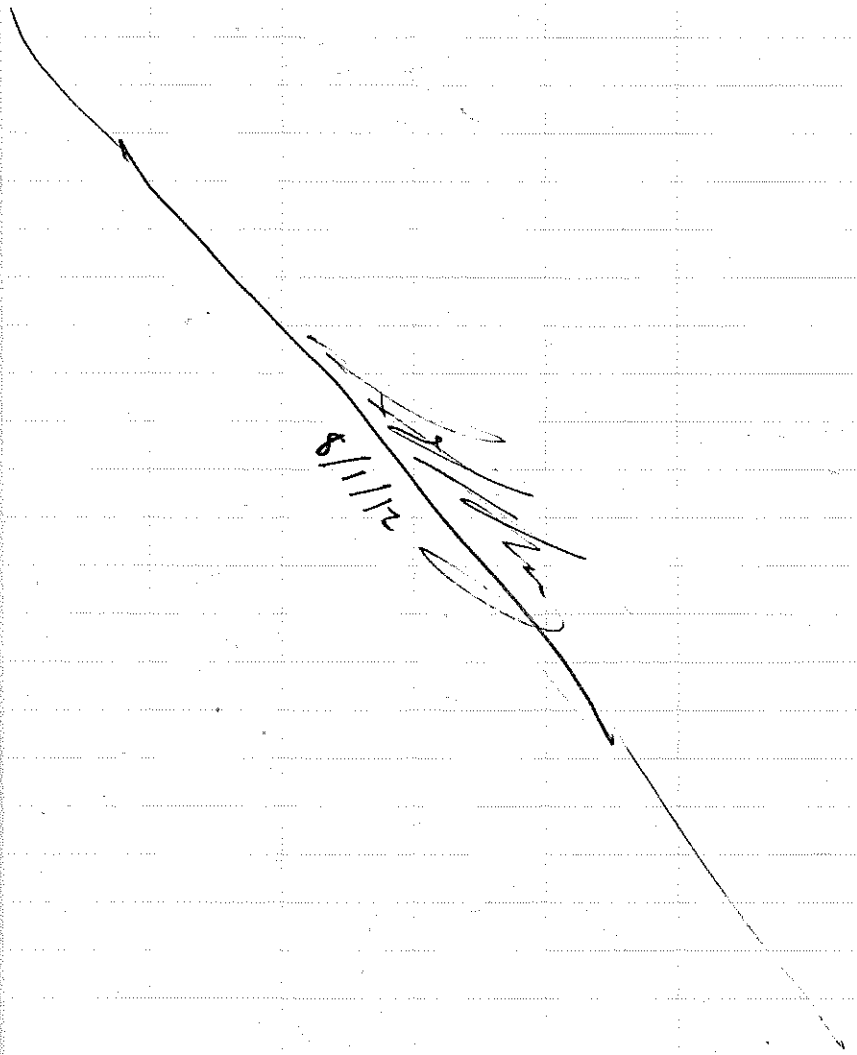




8/1/12 Standard Precision

1725 Area 5 is excavated and ER has started Area 6.

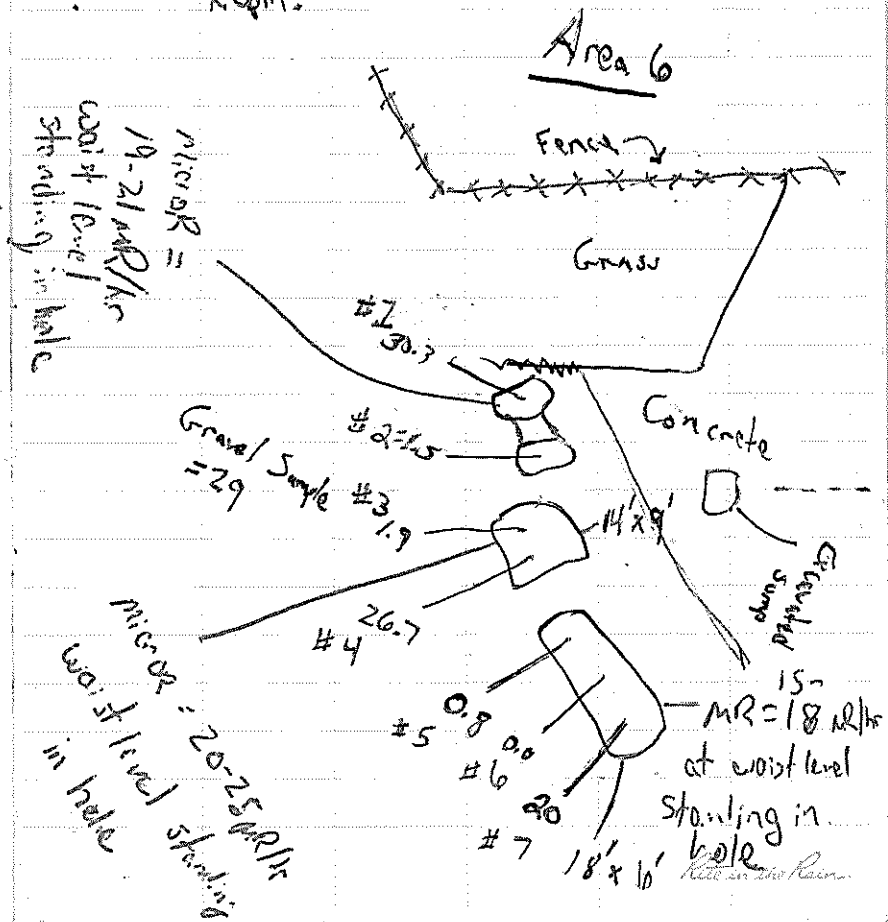
1729 Leave site. Radeco #631.



8/2/12 Standard Precision

0744 Arrive onsite from tailgate safety meeting at Standard Products. ER will be backfilling today

1013 Continue excavating Area 6. Post-excavation readings with a NaI ZnS within the holes were generally 18-30 kcpm.



Area 6

All readings taken standing in hole with Ludlum 19 at waist level

Standard Precision

1706 ER has backfilled some areas.
Leave site.

Rita in the Rain

8/3/12 Standard Precision

0745 Arrive from tailgate safety meeting at Standard Products.

0800 Start Radeco.

0819 ER is excavating Areas 3 and 4.

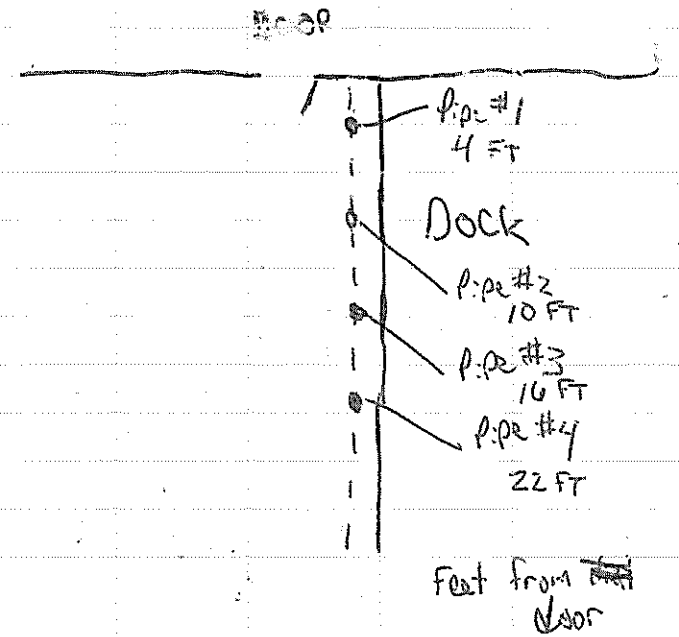
1145 ER has finished excavating Areas 3 and 4.

1220 Rob Monning goes to lunch.

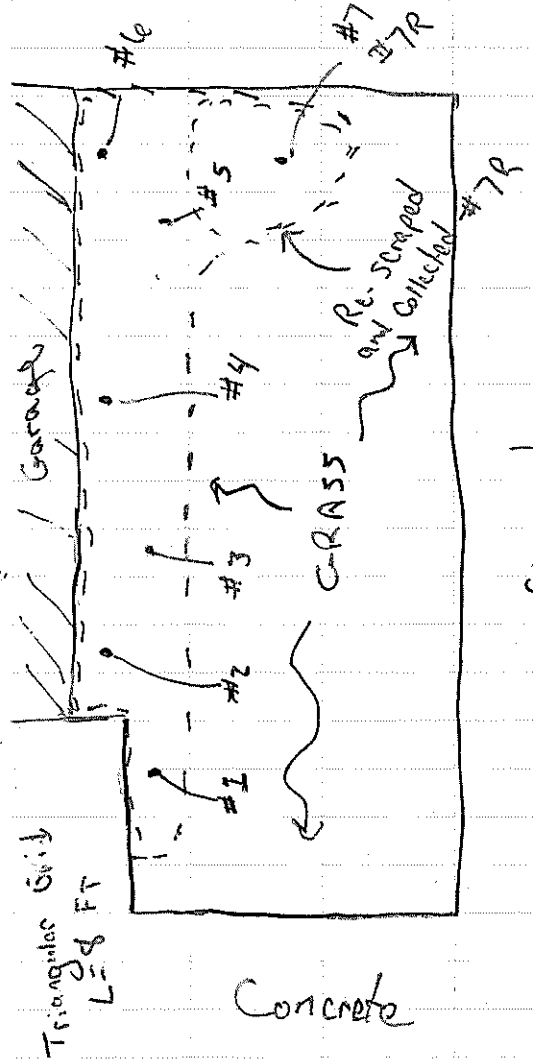
1300 Back from lunch. ER is breaking concrete over the pipe area.

1309 Restart Radeco. Vol = 563.2 ft³

1432 ER has been excavating pipe area.



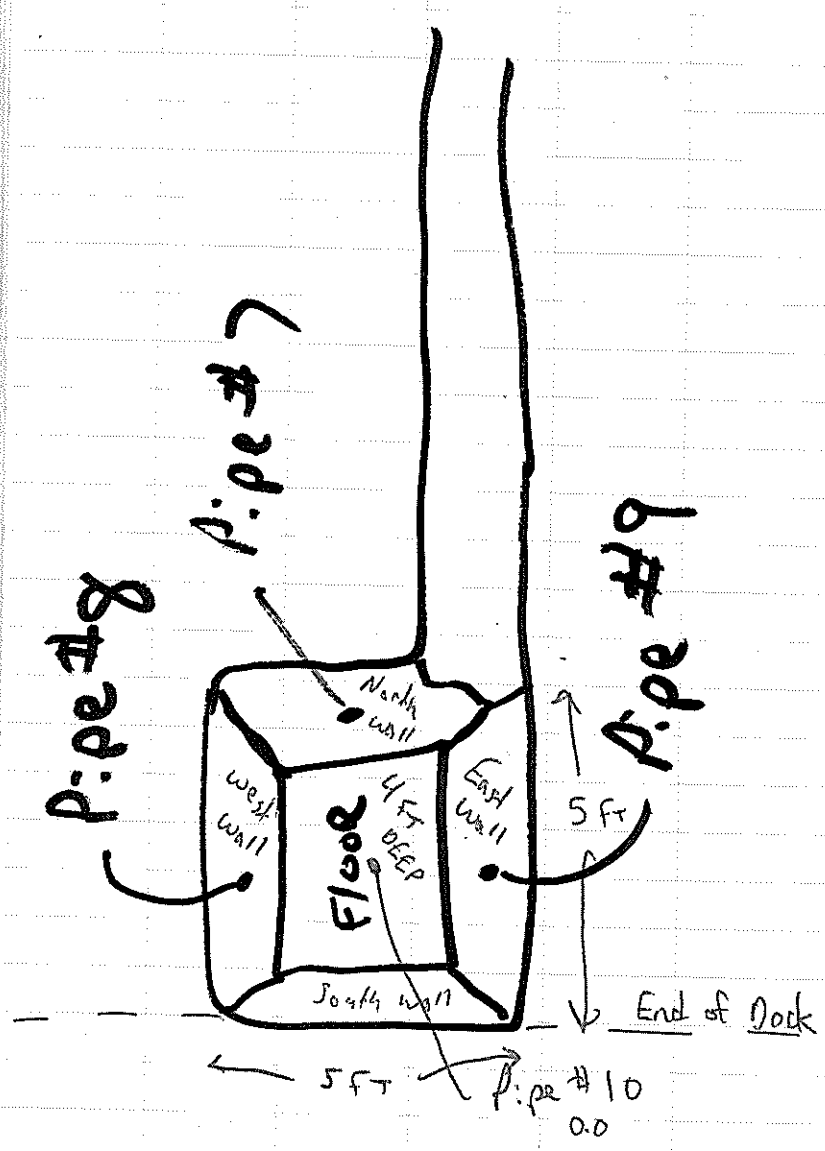
Area 3/4



Post Excavation Readings with Ludlum 2241 NAI 2x2 in excavated area = 13 - 20 kcpm

with Micro R Reading = 12-15 mR/hr

Rain or shine



8/3/12 Standard Precision

1711 ER has dug area 1. Hop Radeco. Vol = 6116.4 ft³.

1715 Check Unit #648, Ludlum 2241 Source = 219kcpm. Unit is ok.

1730 Leave site.

8/3/12

Rite in the Rain

8/4/12 Standard Precision

0845 Rob Manning arrives at Standard Precision from 7 AM tailgate meeting at Standard Products.

0922 Collect reference samples.

0923	REF-1	37.65090
		97.39136
0925	REF-2	37.65099
		97.39130
0927	REF-3	37.65101
		97.39127
0929	REF-4	37.65099
		97.39115
0932	REF-5	37.65091
		97.39117
0934	REF-6	37.65087
		97.39128
0937	REF-7	37.65087
		97.39137

8/4/12

11/7/12 Standard Precision.

0900 Rob Manning onsite to conduct post-removal RAT survey.

1100 RAT Survey complete. Areas surveyed were those areas excavated during removal in July/August.

1130 Collected five 1-minute counts in background area using Ludlum 44-20

Reading	1-Min ~~Count~~ (cpm)
1	19,343
2	23,010
3	22,803
4	24,890
5	20,714

1150 Rob Manning photographs the removal areas.

1200 Leave site.

11/7/12

Rain or Rain

APPENDIX D

TABULATED LABORATORY DATA

TABLE D-1
LABORATORY RESULTS FOR BACKFILL MATERIAL
RADIATION - STANDARD PRECISION SITE (FORMER), WICHITA, KANSAS

Analyte	Units	Backfill Sample	KDHE Tier 2 Risk-Based Cleanup Value for Residential Scenarios
Volatile Organic Compounds (VOC)	-	No VOCs detected at concentrations above laboratory detection limits	-
Semivolatile Organic Compounds (SVOC)	-	No SVOCs detected at concentrations above laboratory detection limits	-
Arsenic	mg/kg	3.4 B	11.3
Barium	mg/kg	116	15,300
Cadmium	mg/kg	< 1.1	39
Chromium	mg/kg	7.9	33.6
Lead	mg/kg	8.6 B, J	400
Mercury	mg/kg	< 0.035	2
Selenium	mg/kg	1.2 B	391
Silver	mg/kg	< 2.1	391
Radium-226	pCi/g	0.89	NE

Notes:
All units in milligrams per kilogram (mg/kg)

B	Laboratory qualifier indicating the analyte was also detected in the method blank
J	Laboratory qualifier indicated the result is less than the laboratory reporting limit and the result is estimated
KDHE	Kansas Department of Health and Environment
mg/kg	Milligrams per kilogram
NE	Not established
pCi/g	picoCuries per gram

TABLE D-2

LABORATORY RESULTS FOR FINAL STATUS SURVEY SOIL SAMPLES
RADIATION - STANDARD PRECISION, INC. (FORMER) - WICHITA, KANSAS

Sample Information		U-238 Decay Series						U-235 Decay Series			Th-232 Decay Series				
Sample Name	**Date Collected**	**U-238**	**Th-234**	**Ra-226**	**Pb-214**	**Bi-214**	**Pb-210**	**U-235**	**Pa-231**	**Ac-227**	**Ra-228**	**Ac-228**	**Pb-212**	**Bi-212**	**Tl-208**
Area 1 Survey Unit: Area at Northwest Corner of Property															
AREA 1	8/3/2012	< 3.2	< 3.2	7.0	7.23	7	3.4	< 0.75	< 2.6	< 1.1	0.55	0.55	0.8	< 0.84	0.16
Area 2 Survey Unit: Interior Area and Exterior Pipe Run															
PIT-NORTH	7/30/2012	< 2.23	< 2.23	1.17	1.46	1.17	< 2.18	< 0.478	< 1.94	< 0.521	< 0.301	< 0.301	0.564	< 0.682	0.195
PIT-SOUTH	7/30/2012	< 1.55	< 1.55	0.468	0.426	0.468	< 1.53	< 0.357	< 1.61	< 0.22	0.513	0.513	0.4	< 0.523	0.186
PIT-EAST	7/30/2012	< 1.61	< 1.61	0.827	0.871	0.827	< 2.2	< 0.437	< 1.97	< 0.589	0.27	0.27	0.412	< 0.662	< 0.0961
PIT WEST	7/30/2012	< 1.71	< 1.71	0.356	0.375	0.356	< 1.93	< 0.348	< 1.75	< 0.794	0.28	0.28	0.373	< 0.506	0.143
PIPE #1	8/3/2012	< 2.3	< 2.3	3.45	3.61	3.45	< 2.5	< 0.56	< 2.5	< 0.53	0.91	0.91	0.68	< 0.75	0.238
PIPE #2	8/3/2012	< 2.94	< 2.94	4.79	4.88	4.79	< 3.13	< 0.652	< 2.45	< 0.94	0.915	0.915	0.623	< 0.672	0.258
PIPE #3	8/3/2012	< 1.7	< 1.7	0.759	1.07	0.759	< 2.31	< 0.316	< 2.05	< 0.312	0.722	0.722	0.597	< 0.63	0.216
PIPE #4	8/3/2012	< 1.59	< 1.59	0.423	0.58	0.423	< 2.14	< 0.329	< 1.87	< 0.399	0.609	0.609	0.577	< 0.782	0.186
PIPE #5	8/3/2012	< 1.79	< 1.79	0.656	0.635	0.656	< 2.01	< 0.351	< 1.78	< 0.383	0.694	0.694	0.603	< 0.525	0.239
PIPE #6	8/3/2012	< 1.7	< 1.7	0.66	0.79	0.66	< 2.4	< 0.41	< 1.3	< 0.96	0.85	0.85	0.6	0.8	0.203
PIPE #7	8/3/2012	< 2.3	< 2.3	1.12	1.16	1.12	2.5	< 0.54	< 2.4	< 0.7	1.06	1.06	1	1.59	0.36
PIPE #8	8/3/2012	1.5	1.5	0.91	0.98	0.91	3.6	< 0.33	< 1.5	< 0.99	0.84	0.84	0.58	< 0.61	0.293
PIPE #9	8/3/2012	< 2.25	< 2.25	2.10	1.99	2.1	6.6	< 0.419	< 2.24	< 0.724	0.867	0.867	0.669	< 0.582	0.295
PIPE #10	8/3/2012	< 2.8	< 2.8	1.48	1.68	1.48	3.1	< 0.53	< 3	< 0.87	0.97	0.97	0.85	< 0.74	0.34
			Minimum	0.356											
			Maximum	4.79											
			Average	1.4											
Areas 3 & 4 Survey Unit: Area Abutting South Side of Detached Garage															
AREA 3 #1	8/3/2012	< 2.1	< 2.1	1.23	1.27	1.23	< 2	< 0.38	< 1.8	< 1.1	0.7	0.7	0.54	< 0.46	0.102
AREA 3 #2	8/3/2012	< 2.19	< 2.19	1.96	1.62	1.96	4.29	< 0.542	< 2.14	< 1.45	1.1	1.1	0.875	< 0.657	0.254
AREA 3 #3	8/3/2012	< 2.99	< 2.99	2.70	2.37	2.7	< 2.65	< 0.608	< 3.37	< 1.17	1.47	1.47	0.883	< 0.97	0.284
AREA 3 #4	8/3/2012	< 2.52	< 2.52	1.43	1.69	1.43	< 2.48	< 0.538	< 2.66	< 1.53	0.948	0.948	0.927	1.13	0.335
AREA 3 #5	8/3/2012	< 1.83	< 1.83	0.905	0.977	0.905	< 2.43	< 0.413	< 1.92	< 1.42	0.996	0.996	0.948	< 0.678	0.353
AREA 3 #6	8/3/2012	< 2.1	< 2.1	0.80	0.93	0.8	< 2.5	< 0.43	< 2.3	< 1.5	1.32	1.32	0.9	< 0.7	0.34
AREA 3 #7R	8/3/2012	< 2.1	< 2.1	0.91	1.21	0.91	< 2.4	< 0.5	< 2.6	< 0.9	1.43	1.43	1	1.29	0.51
			Minimum	0.80											
			Maximum	2.70											
			Average	1.4											
Area 5 Survey Unit: Small Discrete Area on South-Central Portion of Property															
AREA 5	8/1/2012	< 2.3	< 2.3	1.55	1.5	1.55	3.6	< 0.58	< 2.6	< 1.3	1.13	1.13	1.16	0.68	0.347

TABLE D-2
(continued)

LABORATORY RESULTS FOR FINAL STATUS SURVEY SOIL SAMPLES
RADIATION - STANDARD PRECISION, INC. (FORMER) - WICHITA, KANSAS

Sample Information		U-238 Decay Series						U-235 Decay Series			Th-232 Decay Series				
Sample Name	**Date Collected**	**U-238**	**Th-234**	**Ra-226**	**Pb-214**	**Bi-214**	**Pb-210**	**U-235**	**Pa-231**	**Ac-227**	**Ra-228**	**Ac-228**	**Pb-212**	**Bi-212**	**Tl-208**
Area 6 Survey Unit: Multiple Discrete Areas Along South Edge of Property															
AREA 6 #1R	8/2/2012	< 3.02	< 3.02	2.98	3.3	2.98	< 2.95	< 0.722	< 3.17	< 2	1.35	1.35	1.41	< 0.754	0.497
AREA 6 #1R (duplicate)[1]	8/2/2012	< 2.76	< 2.76	2.84	3.37	2.84	< 2.83	< 0.584	< 2.1	< 1	1.48	1.48	1.35	1.17	0.549
AREA 6 #2	8/2/2012	< 3.23	< 3.23	4.99	5.58	4.99	4.34	< 0.915	< 3.86	< 0.593	1.48	1.48	1.1	< 0.998	0.586
AREA 6 #3	8/2/2012	< 3.3	< 3.3	5.84	6.02	5.84	6.3	< 0.76	< 3.6	< 1.2	1.24	1.24	1.04	1.27	0.38
AREA 6 #4R	8/2/2012	< 2.36	< 2.36	1.35	1.56	1.35	< 2.22	< 0.516	< 2.62	< 1.69	1.23	1.23	1.03	< 0.806	0.28
AREA 6 #5	8/2/2012	< 2.98	< 2.98	2.88	3.13	2.88	< 2.61	< 0.602	< 2	< 0.966	1.23	1.23	1.17	< 0.709	0.407
AREA 6 #6	8/2/2012	< 2.86	< 2.86	1.50	1.5	1.5	< 3.46	< 0.731	< 3.75	< 2.54	1.02	1.02	1.28	< 1.43	0.504
AREA 6 #7R	8/2/2012	< 2.99	< 2.99	3.69	4	3.69	< 3.23	< 0.692	< 3.53	< 0.706	0.712	0.712	0.934	< 0.802	0.416
			Minimum	1.35											
			Maximum	5.84											
			Average	3.32											
Area 7 Survey Unit: Sump Excavation (Near Surface Soil)															
NORTH A	8/1/2012	< 1.5	< 1.5	1.00	1.4	1	< 2.1	< 0.37	< 2	< 0.25	0.97	0.97	0.73	< 0.65	0.322
NORTH B	8/1/2012	< 2.3	< 2.3	0.88	1.04	0.88	< 2.3	< 0.45	< 1.9	< 0.75	0.76	0.76	0.7	< 0.67	0.243
NORTH C	8/1/2012	< 4.7	< 4.7	12.0	11.5	12	12.5	< 0.89	< 4.9	< 1.2	0.71	0.71	0.64	< 1.1	0.27
NORTH D	8/1/2012	< 2.03	< 2.03	0.817	0.913	0.817	7.55	< 0.36	< 2.1	< 1.16	0.855	0.855	0.667	< 0.537	0.236
NORTH E	8/1/2012	< 2.19	< 2.19	0.473	0.642	0.473	< 2.03	< 0.459	< 2.13	< 1.15	0.537	0.537	0.609	< 0.55	0.253
NORTH F	8/1/2012	< 1.84	< 1.84	1.07	1.29	1.07	< 2.1	< 0.464	< 2.23	< 0.424	1.12	1.12	0.872	1.1	0.266
SOUTH 1	7/31/2012	< 3.9	< 3.9	6.98	6.75	6.98	5.88	< 0.793	< 3.62	< 0.583	0.735	0.735	0.932	< 0.808	0.438
SOUTH 2	7/31/2012	< 2.16	< 2.16	2.60	2.86	2.6	3.84	< 0.56	< 2.51	< 0.821	0.672	0.672	0.811	< 0.631	0.298
SOUTH 3	7/31/2012	< 3.8	< 3.8	5.84	6.15	5.84	7.3	< 1.1	< 3.9	< 1	< 0.58	< 0.58	0.51	< 1.3	< 0.16
EAST A	8/1/2012	< 1.65	< 1.65	0.801	0.868	0.801	< 2.06	< 0.455	< 1.8	< 1.17	0.778	0.778	0.751	< 0.494	0.232
EAST A (duplicate)[1]	8/1/2012	< 2.26	< 2.26	0.779	0.858	0.779	< 2.25	< 0.414	< 2.37	< 0.962	0.906	0.906	0.687	< 0.695	0.252
EAST B	8/1/2012	< 2.05	< 2.05	1.42	1.54	1.42	< 1.98	< 0.422	< 1.6	< 0.472	1	1	0.733	< 0.529	0.291
WEST A	8/1/2012	< 2.8	< 2.8	5.33	5.87	5.33	2.9	< 0.72	< 1.8	< 0.87	0.52	0.52	0.73	< 0.68	0.28
WEST B	8/1/2012	< 1.7	< 1.7	0.77	0.91	0.77	< 2	< 0.43	< 1.9	0.37	0.65	0.65	0.68	< 0.57	0.196
WEST C	8/1/2012	< 2	< 2	1.32	1.37	1.32	< 2	< 0.51	< 2	< 0.68	0.81	0.81	0.61	0.82	0.243
WEST D	8/1/2012	< 2.1	< 2.1	2.38	2.48	2.38	5	< 0.62	< 2.4	< 1.2	0.99	0.99	0.74	< 0.79	0.281
			Minimum	0.473											
			Maximum	12.0											
			Average	2.9											

TABLE D-2
(continued)

LABORATORY RESULTS FOR FINAL STATUS SURVEY SOIL SAMPLES
RADIATION - STANDARD PRECISION, INC. (FORMER) - WICHITA, KANSAS

Sample Information		U-238 Decay Series						U-235 Decay Series			Th-232 Decay Series				
Sample Name	**Date Collected**	**U-238**	**Th-234**	**Ra-226**	**Pb-214**	**Bi-214**	**Pb-210**	**U-235**	**Pa-231**	**Ac-227**	**Ra-228**	**Ac-228**	**Pb-212**	**Bi-212**	**Tl-208**
Area 8 Survey Unit: Sump Excavation (Subsurface Soil)															
SOUTH 4	7/31/2012	< 2.3	< 2.3	2.93	3.01	2.93	4.8	< 0.4	< 2.9	< 1	< 0.39	< 0.39	0.32	< 0.8	< 0.098
SOUTH 5	7/31/2012	< 6.5	< 6.5	35.2	37.4	35.2	21.8	< 1.5	< 4	< 1.7	0.9	0.9	0.79	< 1.4	< 0.25
SOUTH 5 (duplicate)[1]	7/31/2012	< 5.9	< 5.9	34.8	37	34.8	26.4	< 1.5	< 6.1	< 1.5	0.82	0.82	0.72	< 1.6	< 0.24
WEST E	8/1/2012	< 3.2	< 3.2	4.69	4.85	4.69	5.7	< 0.7	< 3	< 0.84	0.68	0.68	0.7	< 0.74	0.26
WEST F	8/1/2012	< 2.6	< 2.6	1.12	1.06	1.12	3.8	< 0.69	< 3.9	< 1.2	1.26	1.26	0.87	< 0.92	0.27
EAST C	8/1/2012	< 2.09	< 2.09	0.918	1.3	0.918	3.14	< 0.423	< 2.37	< 0.411	1.28	1.28	0.957	< 0.585	0.39
EAST D	8/1/2012	< 3.97	< 3.97	2.51	2.32	2.51	6.61	< 0.788	< 3.36	< 2.43	0.852	0.852	1.3	< 1.52	0.573
			Minimum	0.918											
			Maximum	35.2											
			Average	11.7											
Reference Survey Area															
REF-1	8/4/2012	< 1.7	< 1.7	0.69	0.62	0.69	2.5	< 0.37	< 1.6	< 1	0.59	0.59	0.5	< 0.5	0.12
REF-1 (duplicate)[1]	8/4/2012	< 2.4	< 2.4	0.75	0.91	0.75	< 2.8	< 0.49	< 2.9	< 0.99	0.65	0.65	0.49	< 0.72	0.173
REF-2	8/4/2012	< 2.9	< 2.9	1.12	1.35	1.12	< 2.9	< 0.54	< 3.2	< 0.72	0.51	0.51	0.76	< 1.2	0.35
REF-3	8/4/2012	2.1	2.1	1.44	1.58	1.44	3.2	< 0.5	< 2.4	< 0.7	< 0.4	< 0.4	0.36	< 0.9	0.121
REF-4	8/4/2012	< 2	< 2	1.11	1.17	1.11	3.4	< 0.41	< 2.2	< 0.49	1.02	1.02	0.81	< 0.73	0.3
REF-5	8/4/2012	< 2.1	< 2.1	1.07	1.15	1.07	< 2.2	< 0.5	< 1.7	< 0.88	0.87	0.87	0.54	< 0.64	0.152
REF-6	8/4/2012	< 2.1	< 2.1	1.50	1.68	1.5	4.3	< 0.46	< 2.4	< 0.75	0.38	0.38	0.38	< 0.67	0.22
REF-7	8/4/2012	< 1.7	< 1.7	0.95	1.06	0.95	3.7	< 0.37	< 1.7	< 0.64	0.63	0.63	0.56	< 0.4	0.213
			Minimum	0.69											
			Maximum	1.50											
			Average	1.1											

Notes:
All results in picoCuries per gram (pCi/g)

Shaded values indicate Ra-226 concentrations exceeding the 5 pCi/g plus the average background of 1.1 pCi/g (or 6.1 pCi/g).

[1] Laboratory duplicate not included in calculation of survey unit minimum, maximum, or average Ra-226 concentration. As a conservative measure, the duplicate pair with the highest Ra-226 concentration is used in calculations, except for the reference survey area, where the duplicate pair with the lowest Ra-226 concentration is used.

Elements:
Ac: Actinium Bi: Bismuth Pa: Protactinium Pb: Lead Ra: Radium Th: Thorium Tl: Thallium U: Uranium

APPENDIX E

DATA SUPPORTING EMC TESTS

Figure E-1
Ratio of Dose Rate Relative to an Infinite Ground Plane Source

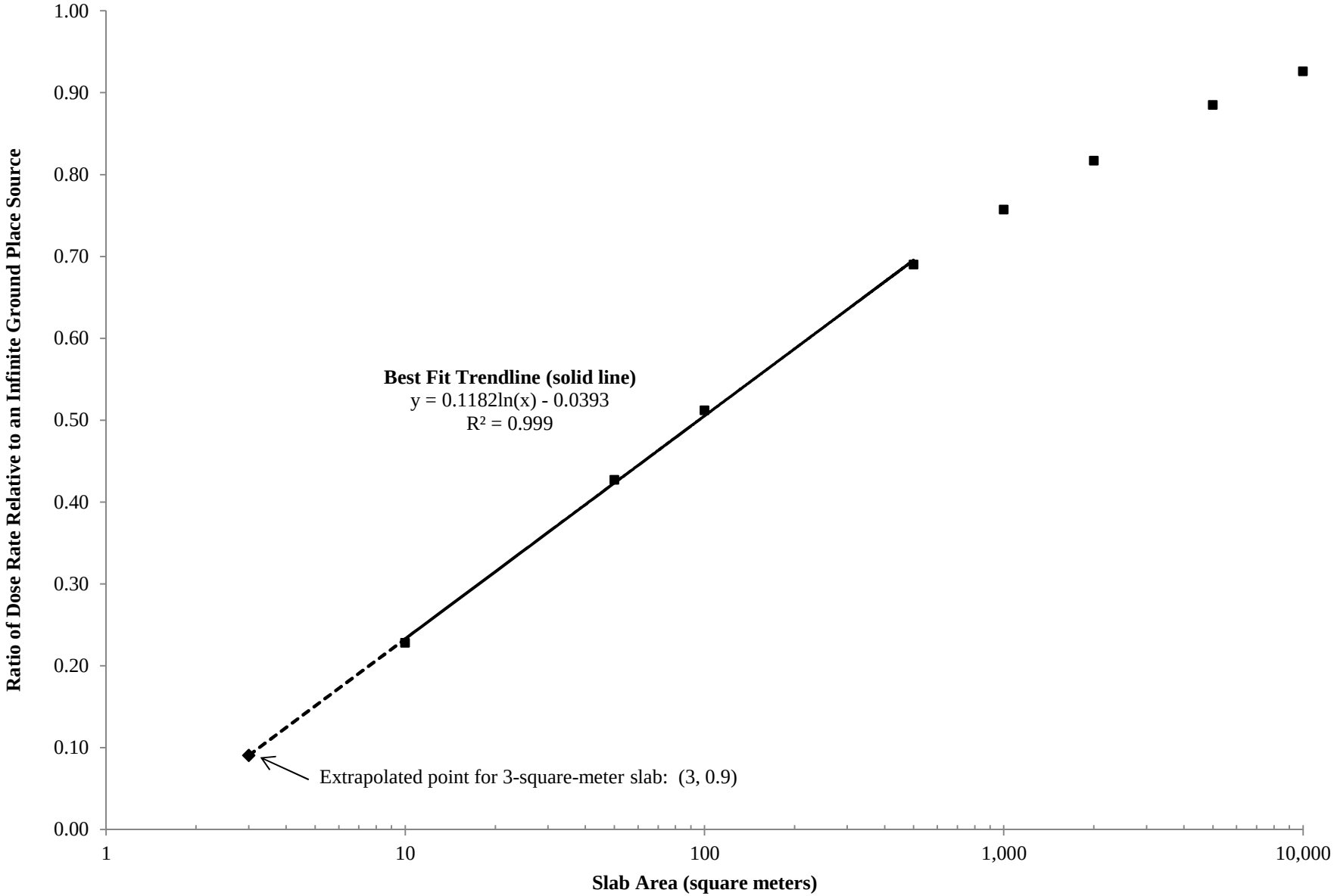


TABLE E-1
DETERMINATION OF AREA FACTORS AND $DCGL_{EMC}$ VALUES FOR GROUND PLANE SOURCES OF VARIOUS SIZE

Size of Ground Plane Source (Slab Size)	**Ratio of Dose Rate Relative to Infinite Ground Plane Source ($RDRR_{inf}$) for Ra-226+D** [see Note 1]	**Ratio of Dose Rate Relative to 10,000 m^2 Ground Plane Source ($RDRR_{10000}$) for Ra-226+D** [see Note 2]	**Area Factor (AF) Corresponding to $RDRR_{10000}$** [see Note 3]	**$DCGL_{EMC}$ Corresponding to $RDRR_{10000}$** [see Note 4]
(m^2)	-	-	-	(pCi/g)
3	0.091	0.098	10.2	51
10	0.228	0.246	4.06	20
20	0.315	0.340	2.94	15
50	0.427	0.461	2.17	11
100	0.512	0.553	1.81	9.0
500	0.690	0.745	1.34	6.7
1000	0.757	0.817	1.22	6.1
2000	0.817	0.882	1.13	5.7
5000	0.885	0.956	1.05	5.2
10000	0.926	1.000	1.00	5.0

Notes:

1 Except for slab sizes of 3 and 20 m^2, dose rate ratios are those specified in *Ratios of Dose Rates for Contaminated Slabs*, K.F. Eckerman, September 20, 2007 (see http://epa-prgs.ornl.gov/radionuclides/ContaminatedSlabs.pdf). Dose rate ratios for slab areas of 3 and 20 m^2 are extrapolated/interpolated from Eckerman data (see Appendix E, Figure E-1).

2 Dose ratio relative to 10,000 m^2 ground plane source calculated by dividing the subject dose rate ratio (relative to infinite ground plane) by 0.926 (i.e, the dose rate ratio relative to infinite ground plane for a slab size of 10,000 m^2).

3 $AF = 1 / RDRR_{10000}$

4 $DCGL_{EMC} = DCGL_W \times AF$; for the Standard Precision, Inc. Site, $DCGL_W = 5.0$ pCi/g

AF	Area factor
$DCGL_{EMC}$	Derived concentration guideline level for elevated measurement comparison
$DCGL_W$	Derived concentration guideline level for average concentrations over a wide area
m^2	Square meter
pCi/g	picoCuries per gram
Ra-226	Radium-226

APPENDIX F

LABORATORY DATA

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

ANALYTICAL REPORT

RADIATION - STANDARD PRECISION

Lot #: F2H090435

Rob Monning

Tetra Tech, EMI ARRA
415 Oak Street
Kansas City, MO 64106

TESTAMERICA LABORATORIES, INC.

Erika Starman
Project Manager

September 7, 2012

13715 Rider Trail North Earth City, MO 63045 **tel** 314.298.8566 **fax** 314.298.8757 **www.testamericainc.com**

Case Narrative
LOT NUMBER: F2H090435

This report contains the analytical results for the 29 samples received under chain of custody by TestAmerica St. Louis on August 9, 2012. These samples are associated with your RADIATION - STANDARD PRECISION project.

The analytical results included in this report meet all applicable quality control procedure requirements.

The test results in this report meet all NELAP requirements for parameters in which accreditations are held by TestAmerica St. Louis. Any exceptions to NELAP requirements are noted in the case narrative. **TestAmerica St. Louis' Florida certification number is E87689.** The case narrative is an integral part of this report.

This report shall not be reproduced, except in full, without the written approval of the laboratory.

All chemical analysis results are based upon sample as received, wet weight, unless noted otherwise. All radiochemistry results are based upon sample as dried and ground with the exception of tritium, unless requested wet weight by the client.

Observations/Nonconformances

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

There were no nonconformances or observations noted with any analysis on this lot.

METHODS SUMMARY

F2H090435

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
Gamma Spectroscopy - Radium-226 & Hits	EML GA-01-R MOD	

References:

EML "ENVIRONMENTAL MEASUREMENTS LABORATORY PROCEDURES MANUAL"
HASL-300 28TH EDITION, VOLUME I and II DEPARTMENT OF ENERGY

SAMPLE SUMMARY

F2H090435

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
MV226	001	EAST A	08/01/12	14:34
MV228	002	EAST D	08/01/12	14:40
MV229	003	PIPE #4	08/03/12	14:24
MV23A	004	EAST B	08/01/12	14:36
MV23C	005	AREA 6 #2	08/02/12	09:58
MV23E	006	AREA 3 #4	08/03/12	11:49
MV23F	007	AREA 3 #5	08/03/12	11:52
MV23G	008	SOUTH 2	07/31/12	16:02
MV23H	009	PIT-SOUTH	07/30/12	15:00
MV23J	010	PIPE #5	08/03/12	15:26
MV23K	011	AREA 6 #6	08/02/12	10:06
MV23L	012	AREA 6 #7R	08/02/12	14:00
MV23M	013	PIT-NORTH	07/30/12	13:42
MV23N	014	AREA 6#4	08/02/12	10:02
MV23P	015	PIPE #2	08/03/12	14:22
MV23Q	016	AREA 6 #5	08/02/12	10:04
MV23R	017	AREA 6 #1R	08/02/12	16:10
MV23T	018	PIT-EAST	07/30/12	13:50
MV23V	019	NORTH E	08/01/12	14:28
MV23W	020	AREA 3 #2	08/03/12	11:44
MV23X	021	PIPE #3	08/03/12	14:23
MV230	022	AREA 3 #3	08/03/12	11:47
MV231	023	SOUTH 1	07/31/12	16:04
MV232	024	EAST C	08/01/12	14:38
MV233	025	AREA 6 #4R	08/02/12	15:31
MV234	026	PIT WEST	07/30/12	13:47
MV235	027	NORTH D	08/01/12	14:25
MV236	028	NORTH F	08/01/12	14:31
MV238	029	PIPE #9	08/03/12	16:38

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

Tetra Tech, EMI (ARRA)

Client Sample ID: EAST A

Radiochemistry

Lab Sample ID: F2H090435-001
Work Order: MV226
Matrix: SOLID

Date Collected: 08/01/12 1434
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	0.0274	U	0.0897		1.17	08/13/12	09/03/12
Actinium 228	**0.778**		**0.173**		**0.205**	**08/13/12**	**09/03/12**
Bismuth 212	0.469	U	0.336		0.494	08/13/12	09/03/12
Bismuth 214	**0.801**		**0.178**		**0.135**	**08/13/12**	**09/03/12**
Lead 210	0.248	U	1.14		2.06	08/13/12	09/03/12
Lead 212	**0.751**		**0.156**		**0.114**	**08/13/12**	**09/03/12**
Lead 214	**0.868**		**0.193**		**0.156**	**08/13/12**	**09/03/12**
Potassium 40	**17.9**		**2.55**		**1.10**	**08/13/12**	**09/03/12**
Protactinium 231	0.553	U	0.428		1.80	08/13/12	09/03/12
Radium (226)	**0.801**		**0.178**	1.00	**0.135**	**08/13/12**	**09/03/12**
Radium 228	**0.778**		**0.173**		**0.205**	**08/13/12**	**09/03/12**
Thallium 208	**0.232**		**0.0672**		**0.0653**	**08/13/12**	**09/03/12**
Thorium 234	1.21	U	1.14		1.65	08/13/12	09/03/12
Uranium 235	0.0598	U	0.165		0.455	08/13/12	09/03/12
Uranium 238	1.21	U	1.14		1.65	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: EAST A DUP

Radiochemistry

Lab Sample ID: F2H090435-001X
Work Order: MV226
Matrix: SOLID

Date Collected: 08/01/12 1434
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	-0.0185	U	0.566		0.962	08/13/12	09/03/12
Actinium 228	**0.906**		**0.194**		**0.105**	**08/13/12**	**09/03/12**
Bismuth 212	0.454	U	0.441		0.695	08/13/12	09/03/12
Bismuth 214	**0.779**		**0.196**		**0.123**	**08/13/12**	**09/03/12**
Lead 210	0.578	U	1.33		2.25	08/13/12	09/03/12
Lead 212	**0.687**		**0.161**		**0.127**	**08/13/12**	**09/03/12**
Lead 214	**0.858**		**0.165**		**0.145**	**08/13/12**	**09/03/12**
Potassium 40	**20.8**		**3.07**		**0.669**	**08/13/12**	**09/03/12**
Protactinium 231	0.361	U	0.337		2.37	08/13/12	09/03/12
Radium (226)	**0.779**		**0.196**	1.00	**0.123**	**08/13/12**	**09/03/12**
Radium 228	**0.906**		**0.194**		**0.105**	**08/13/12**	**09/03/12**
Thallium 208	**0.252**		**0.0797**		**0.0636**	**08/13/12**	**09/03/12**
Thorium 234	0.349	U	0.696		2.26	08/13/12	09/03/12
Uranium 235	0.249	U	0.252		0.414	08/13/12	09/03/12
Uranium 238	0.349	U	0.696		2.26	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: EAST D

Radiochemistry

Lab Sample ID: F2H090435-002
Work Order: MV228
Matrix: SOLID

Date Collected: 08/01/12 1440
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	0.0858	U	0.940		2.43	08/13/12	09/03/12
Actinium 228	**0.852**		**0.351**		**0.667**	**08/13/12**	**09/03/12**
Bismuth 212	0.0	U	0.968		1.52	08/13/12	09/03/12
Bismuth 214	**2.51**		**0.473**		**0.208**	**08/13/12**	**09/03/12**
Lead 210	**6.61**		**3.79**		**4.41**	**08/13/12**	**09/03/12**
Lead 212	**1.30**		**0.276**		**0.212**	**08/13/12**	**09/03/12**
Lead 214	**2.32**		**0.445**		**0.253**	**08/13/12**	**09/03/12**
Potassium 40	**19.5**		**3.74**		**1.44**	**08/13/12**	**09/03/12**
Protactinium 231	0.873	U	1.13		3.36	08/13/12	09/03/12
Radium (226)	**2.51**		**0.473**	1.00	**0.208**	**08/13/12**	**09/03/12**
Radium 228	**0.852**		**0.351**		**0.667**	**08/13/12**	**09/03/12**
Thallium 208	**0.573**		**0.177**		**0.142**	**08/13/12**	**09/03/12**
Thorium 234	1.10	U	1.07		3.97	08/13/12	09/03/12
Uranium 235	0.192	U	0.453		0.788	08/13/12	09/03/12
Uranium 238	1.10	U	1.07		3.97	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIPE #4

Radiochemistry

Lab Sample ID: F2H090435-003
Work Order: MV229
Matrix: SOLID

Date Collected: 08/03/12 1424
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	-0.0663	U	0.229		0.399	08/13/12	09/03/12
Actinium 228	**0.609**		**0.206**		**0.199**	**08/13/12**	**09/03/12**
Bismuth 212	0.0271	U	0.422		0.782	08/13/12	09/03/12
Bismuth 214	**0.423**		**0.135**		**0.125**	**08/13/12**	**09/03/12**
Lead 210	0.453	U	1.20		2.14	08/13/12	09/03/12
Lead 212	**0.577**		**0.127**		**0.0801**	**08/13/12**	**09/03/12**
Lead 214	**0.580**		**0.168**		**0.140**	**08/13/12**	**09/03/12**
Potassium 40	**21.2**		**3.26**		**0.767**	**08/13/12**	**09/03/12**
Protactinium 231	0.644	U	0.534		1.87	08/13/12	09/03/12
Radium (226)	**0.423**		**0.135**	1.00	**0.125**	**08/13/12**	**09/03/12**
Radium 228	**0.609**		**0.206**		**0.199**	**08/13/12**	**09/03/12**
Thallium 208	**0.186**		**0.0757**		**0.0675**	**08/13/12**	**09/03/12**
Thorium 234	0.960	U	0.957		1.59	08/13/12	09/03/12
Uranium 235	0.193	U	0.220		0.329	08/13/12	09/03/12
Uranium 238	0.960	U	0.957		1.59	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: EAST B

Radiochemistry

Lab Sample ID: F2H090435-004
Work Order: MV23A
Matrix: SOLID

Date Collected: 08/01/12 1436
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	0.198	U	0.227		0.472	08/13/12	09/03/12
Actinium 228	**1.00**		**0.229**		**0.0784**	**08/13/12**	**09/03/12**
Bismuth 212	0.422	U	0.347		0.529	08/13/12	09/03/12
Bismuth 214	**1.42**		**0.246**		**0.136**	**08/13/12**	**09/03/12**
Lead 210	1.80	U	1.39		1.98	08/13/12	09/03/12
Lead 212	**0.733**		**0.139**		**0.0921**	**08/13/12**	**09/03/12**
Lead 214	**1.54**		**0.255**		**0.142**	**08/13/12**	**09/03/12**
Potassium 40	**20.4**		**2.80**		**0.647**	**08/13/12**	**09/03/12**
Protactinium 231	0.736	U	0.779		1.60	08/13/12	09/03/12
Radium (226)	**1.42**		**0.246**	1.00	**0.136**	**08/13/12**	**09/03/12**
Radium 228	**1.00**		**0.229**		**0.0784**	**08/13/12**	**09/03/12**
Thallium 208	**0.291**		**0.0789**		**0.0659**	**08/13/12**	**09/03/12**
Thorium 234	0.717	U	0.624		2.05	08/13/12	09/03/12
Uranium 235	0.149	U	0.253		0.422	08/13/12	09/03/12
Uranium 238	0.717	U	0.624		2.05	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 6 #2

Radiochemistry

Lab Sample ID: F2H090435-005
Work Order: MV23C
Matrix: SOLID

Date Collected: 08/02/12 0958
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	0.554	U	0.387		0.593	08/13/12	09/03/12
Actinium 228	**1.48**		**0.352**		**0.250**	**08/13/12**	**09/03/12**
Bismuth 212	0.411	U	0.600		0.998	08/13/12	09/03/12
Bismuth 214	**4.99**		**0.667**		**0.176**	**08/13/12**	**09/03/12**
Lead 210	**4.34**		**2.90**		**3.41**	**08/13/12**	**09/03/12**
Lead 212	**1.10**		**0.227**		**0.210**	**08/13/12**	**09/03/12**
Lead 214	**5.58**		**0.702**		**0.270**	**08/13/12**	**09/03/12**
Potassium 40	**18.3**		**2.96**		**0.812**	**08/13/12**	**09/03/12**
Protactinium 231	0.449	U	0.880		3.86	08/13/12	09/03/12
Radium (226)	**4.99**		**0.667**	1.00	**0.176**	**08/13/12**	**09/03/12**
Radium 228	**1.48**		**0.352**		**0.250**	**08/13/12**	**09/03/12**
Thallium 208	**0.586**		**0.148**		**0.110**	**08/13/12**	**09/03/12**
Thorium 234	3.04	U	2.60		3.23	08/13/12	09/03/12
Uranium 235	-0.0450	U	2.36		0.915	08/13/12	09/03/12
Uranium 238	3.04	U	2.60		3.23	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 3 #4

Radiochemistry

Lab Sample ID: F2H090435-006
Work Order: MV23E
Matrix: SOLID

Date Collected: 08/03/12 1149
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	0.0226	U	0.165		1.53	08/13/12	09/03/12
Actinium 228	**0.948**		**0.267**		**0.176**	**08/13/12**	**09/03/12**
Bismuth 212	**1.13**		**0.362**		**0.190**	**08/13/12**	**09/03/12**
Bismuth 214	**1.43**		**0.261**		**0.162**	**08/13/12**	**09/03/12**
Lead 210	2.45	U	1.83		2.48	08/13/12	09/03/12
Lead 212	**0.927**		**0.182**		**0.152**	**08/13/12**	**09/03/12**
Lead 214	**1.69**		**0.271**		**0.186**	**08/13/12**	**09/03/12**
Potassium 40	**20.9**		**2.95**		**0.501**	**08/13/12**	**09/03/12**
Protactinium 231	0.734	U	0.418		2.66	08/13/12	09/03/12
Radium (226)	**1.43**		**0.261**	1.00	**0.162**	**08/13/12**	**09/03/12**
Radium 228	**0.948**		**0.267**		**0.176**	**08/13/12**	**09/03/12**
Thallium 208	**0.335**		**0.0924**		**0.0792**	**08/13/12**	**09/03/12**
Thorium 234	0.790	U	0.789		2.52	08/13/12	09/03/12
Uranium 235	-0.0690	U	50.2		0.538	08/13/12	09/03/12
Uranium 238	0.790	U	0.789		2.52	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 3 #5

Radiochemistry

Lab Sample ID: F2H090435-007
Work Order: MV23F
Matrix: SOLID

Date Collected: 08/03/12 1152
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	0.137	U	0.425		1.42	08/13/12	09/03/12
Actinium 228	**0.996**		**0.230**		**0.102**	**08/13/12**	**09/03/12**
Bismuth 212	0.209	U	0.397		0.678	08/13/12	09/03/12
Bismuth 214	**0.905**		**0.193**		**0.137**	**08/13/12**	**09/03/12**
Lead 210	0.649	U	1.38		2.43	08/13/12	09/03/12
Lead 212	**0.948**		**0.178**		**0.124**	**08/13/12**	**09/03/12**
Lead 214	**0.977**		**0.200**		**0.147**	**08/13/12**	**09/03/12**
Potassium 40	**18.3**		**2.76**		**0.679**	**08/13/12**	**09/03/12**
Protactinium 231	0.602	U	0.765		1.92	08/13/12	09/03/12
Radium (226)	**0.905**		**0.193**	1.00	**0.137**	**08/13/12**	**09/03/12**
Radium 228	**0.996**		**0.230**		**0.102**	**08/13/12**	**09/03/12**
Thallium 208	**0.353**		**0.0951**		**0.0712**	**08/13/12**	**09/03/12**
Thorium 234	0.728	U	0.629		1.83	08/13/12	09/03/12
Uranium 235	0.189	U	0.259		0.413	08/13/12	09/03/12
Uranium 238	0.728	U	0.629		1.83	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: SOUTH 2

Radiochemistry

Lab Sample ID: F2H090435-008
Work Order: MV23G
Matrix: SOLID

Date Collected: 07/31/12 1602
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	-0.392	U	0.500		0.821	08/13/12	09/03/12
Actinium 228	**0.672**		**0.213**		**0.319**	**08/13/12**	**09/03/12**
Bismuth 212	0.228	U	0.374		0.631	08/13/12	09/03/12
Bismuth 214	**2.60**		**0.388**		**0.162**	**08/13/12**	**09/03/12**
Lead 210	**3.84**		**1.66**		**2.22**	**08/13/12**	**09/03/12**
Lead 212	**0.811**		**0.168**		**0.154**	**08/13/12**	**09/03/12**
Lead 214	**2.86**		**0.396**		**0.166**	**08/13/12**	**09/03/12**
Potassium 40	**16.6**		**2.51**		**0.855**	**08/13/12**	**09/03/12**
Protactinium 231	0.0846	U	0.138		2.51	08/13/12	09/03/12
Radium (226)	**2.60**		**0.388**	1.00	**0.162**	**08/13/12**	**09/03/12**
Radium 228	**0.672**		**0.213**		**0.319**	**08/13/12**	**09/03/12**
Thallium 208	**0.298**		**0.118**		**0.108**	**08/13/12**	**09/03/12**
Thorium 234	1.32	U	0.854		2.16	08/13/12	09/03/12
Uranium 235	0.0268	U	0.0604		0.560	08/13/12	09/03/12
Uranium 238	1.32	U	0.854		2.16	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIT-SOUTH

Radiochemistry

Lab Sample ID: F2H090435-009
Work Order: MV23H
Matrix: SOLID

Date Collected: 07/30/12 1500
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	0.153	U	0.126		0.220	08/13/12	09/03/12
Actinium 228	**0.513**		**0.147**		**0.298**	**08/13/12**	**09/03/12**
Bismuth 212	0.124	U	0.300		0.523	08/13/12	09/03/12
Bismuth 214	**0.468**		**0.132**		**0.123**	**08/13/12**	**09/03/12**
Lead 210	0.418	U	0.866		1.53	08/13/12	09/03/12
Lead 212	**0.400**		**0.101**		**0.0941**	**08/13/12**	**09/03/12**
Lead 214	**0.426**		**0.131**		**0.133**	**08/13/12**	**09/03/12**
Potassium 40	**21.2**		**2.90**		**0.937**	**08/13/12**	**09/03/12**
Protactinium 231	0.169	U	0.272		1.61	08/13/12	09/03/12
Radium (226)	**0.468**		**0.132**	1.00	**0.123**	**08/13/12**	**09/03/12**
Radium 228	**0.513**		**0.147**		**0.298**	**08/13/12**	**09/03/12**
Thallium 208	**0.186**		**0.0773**		**0.0743**	**08/13/12**	**09/03/12**
Thorium 234	0.684	U	0.878		1.55	08/13/12	09/03/12
Uranium 235	0.0926	U	0.145		0.357	08/13/12	09/03/12
Uranium 238	0.684	U	0.878		1.55	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIPE #5

Radiochemistry

Lab Sample ID: F2H090435-010
Work Order: MV23J
Matrix: SOLID

Date Collected: 08/03/12 1526
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	-0.444	U	0.259		0.383	08/13/12	09/03/12
Actinium 228	**0.694**		**0.184**		**0.0790**	**08/13/12**	**09/03/12**
Bismuth 212	0.359	U	0.336		0.525	08/13/12	09/03/12
Bismuth 214	**0.656**		**0.167**		**0.131**	**08/13/12**	**09/03/12**
Lead 210	1.72	U	1.52		2.01	08/13/12	09/03/12
Lead 212	**0.603**		**0.145**		**0.123**	**08/13/12**	**09/03/12**
Lead 214	**0.635**		**0.155**		**0.131**	**08/13/12**	**09/03/12**
Potassium 40	**21.5**		**2.92**		**0.652**	**08/13/12**	**09/03/12**
Protactinium 231	0.341	U	0.636		1.78	08/13/12	09/03/12
Radium (226)	**0.656**		**0.167**	1.00	**0.131**	**08/13/12**	**09/03/12**
Radium 228	**0.694**		**0.184**		**0.0790**	**08/13/12**	**09/03/12**
Thallium 208	**0.239**		**0.0624**		**0.0508**	**08/13/12**	**09/03/12**
Thorium 234	0.793	U	1.06		1.79	08/13/12	09/03/12
Uranium 235	0.114	U	0.202		0.351	08/13/12	09/03/12
Uranium 238	0.793	U	1.06		1.79	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 6 #6

Radiochemistry

Lab Sample ID: F2H090435-011
Work Order: MV23K
Matrix: SOLID

Date Collected: 08/02/12 1006
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	0.0660	U	0.864		2.54	08/13/12	09/03/12
Actinium 228	**1.02**		**0.402**		**0.485**	**08/13/12**	**09/03/12**
Bismuth 212	0.640	U	0.867		1.43	08/13/12	09/03/12
Bismuth 214	**1.50**		**0.384**		**0.266**	**08/13/12**	**09/03/12**
Lead 210	1.52	U	2.19		3.46	08/13/12	09/03/12
Lead 212	**1.28**		**0.296**		**0.229**	**08/13/12**	**09/03/12**
Lead 214	**1.50**		**0.338**		**0.280**	**08/13/12**	**09/03/12**
Potassium 40	**16.8**		**3.52**		**1.56**	**08/13/12**	**09/03/12**
Protactinium 231	0.512	U	1.03		3.75	08/13/12	09/03/12
Radium (226)	**1.50**		**0.384**	1.00	**0.266**	**08/13/12**	**09/03/12**
Radium 228	**1.02**		**0.402**		**0.485**	**08/13/12**	**09/03/12**
Thallium 208	**0.504**		**0.155**		**0.124**	**08/13/12**	**09/03/12**
Thorium 234	1.48	U	1.82		2.86	08/13/12	09/03/12
Uranium 235	0.159	U	0.377		0.731	08/13/12	09/03/12
Uranium 238	1.48	U	1.82		2.86	08/13/12	09/03/12

NOTE (S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 6 #7R

Radiochemistry

Lab Sample ID: F2H090435-012
Work Order: MV23L
Matrix: SOLID

Date Collected: 08/02/12 1400
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	-0.117	U	0.415		0.706	08/13/12	09/03/12
Actinium 228	**0.712**		**0.286**		**0.406**	**08/13/12**	**09/03/12**
Bismuth 212	0.612	U	0.523		0.802	08/13/12	09/03/12
Bismuth 214	**3.69**		**0.534**		**0.207**	**08/13/12**	**09/03/12**
Lead 210	2.66	U	2.00		3.23	08/13/12	09/03/12
Lead 212	**0.934**		**0.189**		**0.150**	**08/13/12**	**09/03/12**
Lead 214	**4.00**		**0.524**		**0.222**	**08/13/12**	**09/03/12**
Potassium 40	**19.2**		**3.10**		**1.06**	**08/13/12**	**09/03/12**
Protactinium 231	1.03	U	0.894		3.53	08/13/12	09/03/12
Radium (226)	**3.69**		**0.534**	1.00	**0.207**	**08/13/12**	**09/03/12**
Radium 228	**0.712**		**0.286**		**0.406**	**08/13/12**	**09/03/12**
Thallium 208	**0.416**		**0.135**		**0.112**	**08/13/12**	**09/03/12**
Thorium 234	0.714	U	0.791		2.99	08/13/12	09/03/12
Uranium 235	0.186	U	0.176		0.692	08/13/12	09/03/12
Uranium 238	0.714	U	0.791		2.99	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIT-NORTH

Radiochemistry

Lab Sample ID: F2H090435-013
Work Order: MV23M
Matrix: SOLID

Date Collected: 07/30/12 1342
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	-0.160	U	0.311		0.521	08/13/12	09/03/12
Actinium 228	0.295	U	0.152		0.301	08/13/12	09/03/12
Bismuth 212	0.00275	U	0.376		0.682	08/13/12	09/03/12
Bismuth 214	**1.17**		**0.227**		**0.153**	**08/13/12**	**09/03/12**
Lead 210	1.65	U	1.50		2.18	08/13/12	09/03/12
Lead 212	**0.564**		**0.121**		**0.105**	**08/13/12**	**09/03/12**
Lead 214	**1.46**		**0.233**		**0.117**	**08/13/12**	**09/03/12**
Potassium 40	**21.7**		**2.97**		**0.457**	**08/13/12**	**09/03/12**
Protactinium 231	0.208	U	1.11		1.94	08/13/12	09/03/12
Radium (226)	**1.17**		**0.227**	1.00	**0.153**	**08/13/12**	**09/03/12**
Radium 228	0.295	U	0.152		0.301	08/13/12	09/03/12
Thallium 208	**0.195**		**0.0774**		**0.0778**	**08/13/12**	**09/03/12**
Thorium 234	0.135	U	0.557		2.23	08/13/12	09/03/12
Uranium 235	0.0396	U	0.275		0.478	08/13/12	09/03/12
Uranium 238	0.135	U	0.557		2.23	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 6#4

Radiochemistry

Lab Sample ID: F2H090435-014
Work Order: MV23N
Matrix: SOLID

Date Collected: 08/02/12 1002
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	0.723	U	0.916		1.86	08/13/12	09/05/12
Actinium 228	**2.12**		**1.02**		**1.26**	**08/13/12**	**09/05/12**
Bismuth 212	-0.580	U	1.57		2.66	08/13/12	09/05/12
Bismuth 214	**44.6**		**4.86**		**0.611**	**08/13/12**	**09/05/12**
Lead 210	**23.7**		**6.80**		**7.88**	**08/13/12**	**09/05/12**
Lead 212	**1.07**		**0.355**		**0.495**	**08/13/12**	**09/05/12**
Lead 214	**47.6**		**5.08**		**0.724**	**08/13/12**	**09/05/12**
Potassium 40	**21.2**		**4.28**		**2.69**	**08/13/12**	**09/05/12**
Protactinium 231	1.42	U	3.04		9.61	08/13/12	09/05/12
Radium (226)	**44.6**		**4.86**	1.00	**0.611**	**08/13/12**	**09/05/12**
Radium 228	**2.12**		**1.02**		**1.26**	**08/13/12**	**09/05/12**
Thallium 208	0.350	U	0.284		0.380	08/13/12	09/05/12
Thorium 234	1.62	U	5.40		9.00	08/13/12	09/05/12
Uranium 235	-1.03	U	1.37		2.25	08/13/12	09/05/12
Uranium 238	1.62	U	5.40		9.00	08/13/12	09/05/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIPE #2

Radiochemistry

Lab Sample ID: F2H090435-015
Work Order: MV23P
Matrix: SOLID

Date Collected: 08/03/12 1422
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	-0.884	U	0.597		0.940	08/13/12	09/03/12
Actinium 228	**0.915**		**0.241**		**0.235**	**08/13/12**	**09/03/12**
Bismuth 212	-0.0191	U	0.372		0.672	08/13/12	09/03/12
Bismuth 214	**4.79**		**0.609**		**0.178**	**08/13/12**	**09/03/12**
Lead 210	2.46	U	2.40		3.13	08/13/12	09/03/12
Lead 212	**0.623**		**0.147**		**0.158**	**08/13/12**	**09/03/12**
Lead 214	**4.88**		**0.584**		**0.202**	**08/13/12**	**09/03/12**
Potassium 40	**20.8**		**2.92**		**0.818**	**08/13/12**	**09/03/12**
Protactinium 231	1.11	U	1.09		2.45	08/13/12	09/03/12
Radium (226)	**4.79**		**0.609**	1.00	**0.178**	**08/13/12**	**09/03/12**
Radium 228	**0.915**		**0.241**		**0.235**	**08/13/12**	**09/03/12**
Thallium 208	**0.258**		**0.0954**		**0.0884**	**08/13/12**	**09/03/12**
Thorium 234	0.840	U	1.73		2.94	08/13/12	09/03/12
Uranium 235	-0.165	U	0.812		0.652	08/13/12	09/03/12
Uranium 238	0.840	U	1.73		2.94	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 6 #5

Radiochemistry

Lab Sample ID: F2H090435-016
Work Order: MV23Q
Matrix: SOLID

Date Collected: 08/02/12 1004
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226077		Yld %
Actinium 227	-0.649	U	0.599		0.966	08/13/12	09/03/12
Actinium 228	**1.23**		**0.321**		**0.288**	**08/13/12**	**09/03/12**
Bismuth 212	0.114	U	0.401		0.709	08/13/12	09/03/12
Bismuth 214	**2.88**		**0.436**		**0.210**	**08/13/12**	**09/03/12**
Lead 210	1.75	U	1.81		2.61	08/13/12	09/03/12
Lead 212	**1.17**		**0.228**		**0.170**	**08/13/12**	**09/03/12**
Lead 214	**3.13**		**0.418**		**0.225**	**08/13/12**	**09/03/12**
Potassium 40	**18.5**		**2.75**		**1.06**	**08/13/12**	**09/03/12**
Protactinium 231	0.870	U	0.770		2.00	08/13/12	09/03/12
Radium (226)	**2.88**		**0.436**	1.00	**0.210**	**08/13/12**	**09/03/12**
Radium 228	**1.23**		**0.321**		**0.288**	**08/13/12**	**09/03/12**
Thallium 208	**0.407**		**0.111**		**0.0990**	**08/13/12**	**09/03/12**
Thorium 234	0.556	U	0.823		2.98	08/13/12	09/03/12
Uranium 235	0.321	U	0.362		0.602	08/13/12	09/03/12
Uranium 238	0.556	U	0.823		2.98	08/13/12	09/03/12

NOTE (S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 6 #1R

Radiochemistry

Lab Sample ID: F2H090435-017
Work Order: MV23R
Matrix: SOLID

Date Collected: 08/02/12 1610
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	-0.770	U	0.626		1.00	08/13/12	09/05/12
Actinium 228	**1.48**		**0.322**		**0.278**	**08/13/12**	**09/05/12**
Bismuth 212	**1.17**		**0.642**		**0.635**	**08/13/12**	**09/05/12**
Bismuth 214	**2.84**		**0.427**		**0.162**	**08/13/12**	**09/05/12**
Lead 210	2.32	U	2.06		2.83	08/13/12	09/05/12
Lead 212	**1.35**		**0.235**		**0.151**	**08/13/12**	**09/05/12**
Lead 214	**3.37**		**0.446**		**0.191**	**08/13/12**	**09/05/12**
Potassium 40	**20.8**		**3.17**		**0.724**	**08/13/12**	**09/05/12**
Protactinium 231	1.76	U	1.14		2.10	08/13/12	09/05/12
Radium (226)	**2.84**		**0.427**	1.00	**0.162**	**08/13/12**	**09/05/12**
Radium 228	**1.48**		**0.322**		**0.278**	**08/13/12**	**09/05/12**
Thallium 208	**0.549**		**0.122**		**0.0746**	**08/13/12**	**09/05/12**
Thorium 234	0.772	U	0.856		2.76	08/13/12	09/05/12
Uranium 235	0.0137	U	0.267		0.584	08/13/12	09/05/12
Uranium 238	0.772	U	0.856		2.76	08/13/12	09/05/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 6 #1R DUP

Radiochemistry

Lab Sample ID: F2H090435-017X
Work Order: MV23R
Matrix: SOLID

Date Collected: 08/02/12 1610
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	0.0453	U	0.127		2.00	08/13/12	09/05/12
Actinium 228	**1.35**		**0.292**		**0.281**	**08/13/12**	**09/05/12**
Bismuth 212	0.620	U	0.496		0.754	08/13/12	09/05/12
Bismuth 214	**2.98**		**0.443**		**0.186**	**08/13/12**	**09/05/12**
Lead 210	1.35	U	1.99		2.95	08/13/12	09/05/12
Lead 212	**1.41**		**0.254**		**0.178**	**08/13/12**	**09/05/12**
Lead 214	**3.30**		**0.451**		**0.220**	**08/13/12**	**09/05/12**
Potassium 40	**20.6**		**3.16**		**1.18**	**08/13/12**	**09/05/12**
Protactinium 231	1.52	U	1.01		3.17	08/13/12	09/05/12
Radium (226)	**2.98**		**0.443**	1.00	**0.186**	**08/13/12**	**09/05/12**
Radium 228	**1.35**		**0.292**		**0.281**	**08/13/12**	**09/05/12**
Thallium 208	**0.497**		**0.118**		**0.0945**	**08/13/12**	**09/05/12**
Thorium 234	0.839	U	0.708		3.02	08/13/12	09/05/12
Uranium 235	0.338	U	0.304		0.722	08/13/12	09/05/12
Uranium 238	0.839	U	0.708		3.02	08/13/12	09/05/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIT-EAST

Radiochemistry

Lab Sample ID: F2H090435-018
Work Order: MV23T
Matrix: SOLID

Date Collected: 07/30/12 1350
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	-0.0456	U	0.0998		0.589	08/13/12	09/03/12
Actinium 228	**0.270**		**0.176**		**0.239**	**08/13/12**	**09/03/12**
Bismuth 212	0.0531	U	0.364		0.662	08/13/12	09/03/12
Bismuth 214	**0.827**		**0.185**		**0.0916**	**08/13/12**	**09/03/12**
Lead 210	0.446	U	1.29		2.20	08/13/12	09/03/12
Lead 212	**0.412**		**0.106**		**0.107**	**08/13/12**	**09/03/12**
Lead 214	**0.871**		**0.181**		**0.108**	**08/13/12**	**09/03/12**
Potassium 40	**19.8**		**2.93**		**0.649**	**08/13/12**	**09/03/12**
Protactinium 231	-0.316	U	1.14		1.97	08/13/12	09/03/12
Radium (226)	**0.827**		**0.185**	1.00	**0.0916**	**08/13/12**	**09/03/12**
Radium 228	**0.270**		**0.176**		**0.239**	**08/13/12**	**09/03/12**
Thallium 208	0.0869	U	0.0737		0.0961	08/13/12	09/03/12
Thorium 234	1.35	U	1.24		1.61	08/13/12	09/03/12
Uranium 235	0.0890	U	0.149		0.437	08/13/12	09/03/12
Uranium 238	1.35	U	1.24		1.61	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: NORTH E

Radiochemistry

Lab Sample ID: F2H090435-019
Work Order: MV23V
Matrix: SOLID

Date Collected: 08/01/12 1428
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	0.108	U	0.200		1.15	08/13/12	09/03/12
Actinium 228	**0.537**		**0.166**		**0.255**	**08/13/12**	**09/03/12**
Bismuth 212	0.151	U	0.319		0.550	08/13/12	09/03/12
Bismuth 214	**0.473**		**0.140**		**0.141**	**08/13/12**	**09/03/12**
Lead 210	1.97	U	1.36		2.03	08/13/12	09/03/12
Lead 212	**0.609**		**0.132**		**0.123**	**08/13/12**	**09/03/12**
Lead 214	**0.642**		**0.150**		**0.162**	**08/13/12**	**09/03/12**
Potassium 40	**18.2**		**2.57**		**0.448**	**08/13/12**	**09/03/12**
Protactinium 231	0.102	U	0.164		2.13	08/13/12	09/03/12
Radium (226)	**0.473**		**0.140**	1.00	**0.141**	**08/13/12**	**09/03/12**
Radium 228	**0.537**		**0.166**		**0.255**	**08/13/12**	**09/03/12**
Thallium 208	**0.253**		**0.0808**		**0.0682**	**08/13/12**	**09/03/12**
Thorium 234	0.959	U	0.489		2.19	08/13/12	09/03/12
Uranium 235	0.0757	U	0.120		0.459	08/13/12	09/03/12
Uranium 238	0.959	U	0.489		2.19	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 3 #2

Radiochemistry

Lab Sample ID: F2H090435-020
Work Order: MV23W
Matrix: SOLID

Date Collected: 08/03/12 1144
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	0.0857	U	0.149		1.45	08/13/12	09/03/12
Actinium 228	**1.10**		**0.257**		**0.285**	**08/13/12**	**09/03/12**
Bismuth 212	0.651	U	0.453		0.657	08/13/12	09/03/12
Bismuth 214	**1.96**		**0.327**		**0.166**	**08/13/12**	**09/03/12**
Lead 210	**4.29**		**1.82**		**2.34**	**08/13/12**	**09/03/12**
Lead 212	**0.875**		**0.175**		**0.139**	**08/13/12**	**09/03/12**
Lead 214	**1.62**		**0.281**		**0.168**	**08/13/12**	**09/03/12**
Potassium 40	**19.2**		**2.91**		**0.730**	**08/13/12**	**09/03/12**
Protactinium 231	0.421	U	0.481		2.14	08/13/12	09/03/12
Radium (226)	**1.96**		**0.327**	1.00	**0.166**	**08/13/12**	**09/03/12**
Radium 228	**1.10**		**0.257**		**0.285**	**08/13/12**	**09/03/12**
Thallium 208	**0.254**		**0.0971**		**0.0927**	**08/13/12**	**09/03/12**
Thorium 234	0.975	U	0.726		2.19	08/13/12	09/03/12
Uranium 235	0.187	U	0.302		0.542	08/13/12	09/03/12
Uranium 238	0.975	U	0.726		2.19	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIPE #3

Radiochemistry

Lab Sample ID: F2H090435-021
Work Order: MV23X
Matrix: SOLID

Date Collected: 08/03/12 1423
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	0.112	U	0.227		0.312	08/13/12	09/03/12
Actinium 228	**0.722**		**0.192**		**0.136**	**08/13/12**	**09/03/12**
Bismuth 212	-0.0875	U	0.357		0.630	08/13/12	09/03/12
Bismuth 214	**0.759**		**0.167**		**0.160**	**08/13/12**	**09/03/12**
Lead 210	1.38	U	1.67		2.31	08/13/12	09/03/12
Lead 212	**0.597**		**0.128**		**0.115**	**08/13/12**	**09/03/12**
Lead 214	**1.07**		**0.179**		**0.122**	**08/13/12**	**09/03/12**
Potassium 40	**20.4**		**2.81**		**0.627**	**08/13/12**	**09/03/12**
Protactinium 231	0.177	U	0.326		2.05	08/13/12	09/03/12
Radium (226)	**0.759**		**0.167**	1.00	**0.160**	**08/13/12**	**09/03/12**
Radium 228	**0.722**		**0.192**		**0.136**	**08/13/12**	**09/03/12**
Thallium 208	**0.216**		**0.0669**		**0.0624**	**08/13/12**	**09/03/12**
Thorium 234	1.52	U	1.23		1.70	08/13/12	09/03/12
Uranium 235	-0.0114	U	0.0490		0.316	08/13/12	09/03/12
Uranium 238	1.52	U	1.23		1.70	08/13/12	09/03/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 3 #3

Radiochemistry

Lab Sample ID: F2H090435-022
Work Order: MV230
Matrix: SOLID

Date Collected: 08/03/12 1147
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	-0.809	U	0.729		1.17	08/13/12	09/04/12
Actinium 228	**1.47**		**0.369**		**0.147**	**08/13/12**	**09/04/12**
Bismuth 212	0.545	U	0.604		0.970	08/13/12	09/04/12
Bismuth 214	**2.70**		**0.446**		**0.203**	**08/13/12**	**09/04/12**
Lead 210	1.54	U	1.76		2.65	08/13/12	09/04/12
Lead 212	**0.883**		**0.194**		**0.170**	**08/13/12**	**09/04/12**
Lead 214	**2.37**		**0.368**		**0.172**	**08/13/12**	**09/04/12**
Potassium 40	**22.7**		**3.66**		**1.26**	**08/13/12**	**09/04/12**
Protactinium 231	0.457	U	0.508		3.37	08/13/12	09/04/12
Radium (226)	**2.70**		**0.446**	1.00	**0.203**	**08/13/12**	**09/04/12**
Radium 228	**1.47**		**0.369**		**0.147**	**08/13/12**	**09/04/12**
Thallium 208	**0.284**		**0.109**		**0.136**	**08/13/12**	**09/04/12**
Thorium 234	0.814	U	0.628		2.99	08/13/12	09/04/12
Uranium 235	0.353	U	0.331		0.608	08/13/12	09/04/12
Uranium 238	0.814	U	0.628		2.99	08/13/12	09/04/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: SOUTH 1

Radiochemistry

Lab Sample ID: F2H090435-023
Work Order: MV231
Matrix: SOLID

Date Collected: 07/31/12 1604
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	0.146	U	0.229		0.583	08/13/12	09/04/12
Actinium 228	**0.735**		**0.285**		**0.421**	**08/13/12**	**09/04/12**
Bismuth 212	0.508	U	0.507		0.808	08/13/12	09/04/12
Bismuth 214	**6.98**		**0.855**		**0.215**	**08/13/12**	**09/04/12**
Lead 210	**5.88**		**2.94**		**3.56**	**08/13/12**	**09/04/12**
Lead 212	**0.932**		**0.202**		**0.209**	**08/13/12**	**09/04/12**
Lead 214	**6.75**		**0.827**		**0.261**	**08/13/12**	**09/04/12**
Potassium 40	**20.1**		**2.95**		**0.780**	**08/13/12**	**09/04/12**
Protactinium 231	0.561	U	0.619		3.62	08/13/12	09/04/12
Radium (226)	**6.98**		**0.855**	1.00	**0.215**	**08/13/12**	**09/04/12**
Radium 228	**0.735**		**0.285**		**0.421**	**08/13/12**	**09/04/12**
Thallium 208	**0.438**		**0.121**		**0.102**	**08/13/12**	**09/04/12**
Thorium 234	0.281	U	2.28		3.90	08/13/12	09/04/12
Uranium 235	0.492	U	0.363		0.793	08/13/12	09/04/12
Uranium 238	0.281	U	2.28		3.90	08/13/12	09/04/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: EAST C

Radiochemistry

Lab Sample ID: F2H090435-024
Work Order: MV232
Matrix: SOLID

Date Collected: 08/01/12 1438
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	0.246	U	0.259		0.411	08/13/12	09/04/12
Actinium 228	**1.28**		**0.238**		**0.134**	**08/13/12**	**09/04/12**
Bismuth 212	0.439	U	0.377		0.585	08/13/12	09/04/12
Bismuth 214	**0.918**		**0.200**		**0.146**	**08/13/12**	**09/04/12**
Lead 210	**3.14**		**1.64**		**1.85**	**08/13/12**	**09/04/12**
Lead 212	**0.957**		**0.174**		**0.127**	**08/13/12**	**09/04/12**
Lead 214	**1.30**		**0.205**		**0.130**	**08/13/12**	**09/04/12**
Potassium 40	**20.4**		**2.77**		**0.537**	**08/13/12**	**09/04/12**
Protactinium 231	0.562	U	0.612		2.37	08/13/12	09/04/12
Radium (226)	**0.918**		**0.200**	1.00	**0.146**	**08/13/12**	**09/04/12**
Radium 228	**1.28**		**0.238**		**0.134**	**08/13/12**	**09/04/12**
Thallium 208	**0.390**		**0.0860**		**0.0525**	**08/13/12**	**09/04/12**
Thorium 234	0.686	U	0.600		2.09	08/13/12	09/04/12
Uranium 235	0.198	U	0.257		0.423	08/13/12	09/04/12
Uranium 238	0.686	U	0.600		2.09	08/13/12	09/04/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 6 #4R

Radiochemistry

Lab Sample ID: F2H090435-025
Work Order: MV233
Matrix: SOLID

Date Collected: 08/02/12 1531
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	-0.0872	U	1.01		1.69	08/13/12	09/04/12
Actinium 228	**1.23**		**0.285**		**0.217**	**08/13/12**	**09/04/12**
Bismuth 212	0.237	U	0.470		0.806	08/13/12	09/04/12
Bismuth 214	**1.35**		**0.276**		**0.177**	**08/13/12**	**09/04/12**
Lead 210	1.94	U	1.43		2.22	08/13/12	09/04/12
Lead 212	**1.03**		**0.196**		**0.138**	**08/13/12**	**09/04/12**
Lead 214	**1.56**		**0.264**		**0.163**	**08/13/12**	**09/04/12**
Potassium 40	**17.8**		**2.82**		**0.793**	**08/13/12**	**09/04/12**
Protactinium 231	0.234	U	0.404		2.62	08/13/12	09/04/12
Radium (226)	**1.35**		**0.276**	1.00	**0.177**	**08/13/12**	**09/04/12**
Radium 228	**1.23**		**0.285**		**0.217**	**08/13/12**	**09/04/12**
Thallium 208	**0.280**		**0.0888**		**0.0813**	**08/13/12**	**09/04/12**
Thorium 234	0.380	U	0.628		2.36	08/13/12	09/04/12
Uranium 235	0.0334	U	0.0763		0.516	08/13/12	09/04/12
Uranium 238	0.380	U	0.628		2.36	08/13/12	09/04/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIT WEST

Radiochemistry

Lab Sample ID: F2H090435-026
Work Order: MV234
Matrix: SOLID

Date Collected: 07/30/12 1347
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	0.0147	U	0.467		0.794	08/13/12	09/04/12
Actinium 228	**0.280**		**0.135**		**0.215**	**08/13/12**	**09/04/12**
Bismuth 212	0.170	U	0.298		0.506	08/13/12	09/04/12
Bismuth 214	**0.356**		**0.127**		**0.122**	**08/13/12**	**09/04/12**
Lead 210	1.24	U	1.40		1.93	08/13/12	09/04/12
Lead 212	**0.373**		**0.0997**		**0.117**	**08/13/12**	**09/04/12**
Lead 214	**0.375**		**0.106**		**0.0945**	**08/13/12**	**09/04/12**
Potassium 40	**21.2**		**2.86**		**0.787**	**08/13/12**	**09/04/12**
Protactinium 231	0.127	U	0.216		1.75	08/13/12	09/04/12
Radium (226)	**0.356**		**0.127**	1.00	**0.122**	**08/13/12**	**09/04/12**
Radium 228	**0.280**		**0.135**		**0.215**	**08/13/12**	**09/04/12**
Thallium 208	**0.143**		**0.0548**		**0.0610**	**08/13/12**	**09/04/12**
Thorium 234	0.367	U	0.426		1.71	08/13/12	09/04/12
Uranium 235	0.111	U	0.246		0.348	08/13/12	09/04/12
Uranium 238	0.367	U	0.426		1.71	08/13/12	09/04/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: NORTH D

Radiochemistry

Lab Sample ID: F2H090435-027
Work Order: MV235
Matrix: SOLID

Date Collected: 08/01/12 1425
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	0.0132	U	0.688		1.16	08/13/12	09/04/12
Actinium 228	**0.855**		**0.212**		**0.241**	**08/13/12**	**09/04/12**
Bismuth 212	0.435	U	0.353		0.537	08/13/12	09/04/12
Bismuth 214	**0.817**		**0.169**		**0.134**	**08/13/12**	**09/04/12**
Lead 210	**7.55**		**1.94**		**2.15**	**08/13/12**	**09/04/12**
Lead 212	**0.667**		**0.142**		**0.132**	**08/13/12**	**09/04/12**
Lead 214	**0.913**		**0.199**		**0.150**	**08/13/12**	**09/04/12**
Potassium 40	**21.8**		**2.97**		**0.627**	**08/13/12**	**09/04/12**
Protactinium 231	0.526	U	0.609		2.10	08/13/12	09/04/12
Radium (226)	**0.817**		**0.169**	1.00	**0.134**	**08/13/12**	**09/04/12**
Radium 228	**0.855**		**0.212**		**0.241**	**08/13/12**	**09/04/12**
Thallium 208	**0.236**		**0.0818**		**0.0770**	**08/13/12**	**09/04/12**
Thorium 234	0.707	U	1.18		2.03	08/13/12	09/04/12
Uranium 235	0.122	U	0.225		0.360	08/13/12	09/04/12
Uranium 238	0.707	U	1.18		2.03	08/13/12	09/04/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: NORTH F

Radiochemistry

Lab Sample ID: F2H090435-028
Work Order: MV236
Matrix: SOLID

Date Collected: 08/01/12 1431
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	0.0365	U	0.169		0.424	08/13/12	09/04/12
Actinium 228	**1.12**		**0.240**		**0.197**	**08/13/12**	**09/04/12**
Bismuth 212	**1.10**		**0.458**		**0.375**	**08/13/12**	**09/04/12**
Bismuth 214	**1.07**		**0.226**		**0.166**	**08/13/12**	**09/04/12**
Lead 210	1.19	U	1.44		2.10	08/13/12	09/04/12
Lead 212	**0.872**		**0.170**		**0.119**	**08/13/12**	**09/04/12**
Lead 214	**1.29**		**0.232**		**0.154**	**08/13/12**	**09/04/12**
Potassium 40	**20.6**		**2.87**		**0.996**	**08/13/12**	**09/04/12**
Protactinium 231	0.336	U	0.432		2.23	08/13/12	09/04/12
Radium (226)	**1.07**		**0.226**	1.00	**0.166**	**08/13/12**	**09/04/12**
Radium 228	**1.12**		**0.240**		**0.197**	**08/13/12**	**09/04/12**
Thallium 208	**0.266**		**0.0827**		**0.0755**	**08/13/12**	**09/04/12**
Thorium 234	0.974	U	1.23		1.84	08/13/12	09/04/12
Uranium 235	0.0505	U	0.271		0.464	08/13/12	09/04/12
Uranium 238	0.974	U	1.23		1.84	08/13/12	09/04/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIPE #9

Radiochemistry

Lab Sample ID: F2H090435-029
Work Order: MV238
Matrix: SOLID

Date Collected: 08/03/12 1638
Date Received: 08/09/12 0940

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2226082		Yld %
Actinium 227	-0.391	U	0.444		0.724	08/13/12	09/04/12
Actinium 228	**0.867**		**0.246**		**0.177**	**08/13/12**	**09/04/12**
Bismuth 212	0.335	U	0.362		0.582	08/13/12	09/04/12
Bismuth 214	**2.10**		**0.326**		**0.157**	**08/13/12**	**09/04/12**
Lead 210	**6.60**		**2.02**		**2.18**	**08/13/12**	**09/04/12**
Lead 212	**0.669**		**0.139**		**0.120**	**08/13/12**	**09/04/12**
Lead 214	**1.99**		**0.299**		**0.166**	**08/13/12**	**09/04/12**
Potassium 40	**20.4**		**2.82**		**0.667**	**08/13/12**	**09/04/12**
Protactinium 231	-0.724	U	1.33		2.24	08/13/12	09/04/12
Radium (226)	**2.10**		**0.326**	1.00	**0.157**	**08/13/12**	**09/04/12**
Radium 228	**0.867**		**0.246**		**0.177**	**08/13/12**	**09/04/12**
Thallium 208	**0.295**		**0.0799**		**0.0658**	**08/13/12**	**09/04/12**
Thorium 234	0.374	U	1.31		2.25	08/13/12	09/04/12
Uranium 235	0.0860	U	0.219		0.419	08/13/12	09/04/12
Uranium 238	0.374	U	1.31		2.25	08/13/12	09/04/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

METHOD BLANK REPORT

Radiochemistry

Client Lot ID: F2H090435
Matrix: SOLID

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Lab Sample ID / Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			**pCi/g**	**Batch # 2226077**	**Yld %**		**F2H130000-077B**
Actinium 227	0.0630	U	0.138		0.370	08/13/12	09/03/12
Actinium 228	0.0744	U	0.0780		0.255	08/13/12	09/03/12
Bismuth 212	0.0	U	0.0880		0.475	08/13/12	09/03/12
Bismuth 214	-0.0227	U	0.114		0.179	08/13/12	09/03/12
Lead 210	0.307	U	0.871		1.62	08/13/12	09/03/12
Lead 212	-0.0173	U	0.125		0.116	08/13/12	09/03/12
Lead 214	-0.00585	U	0.0913		0.157	08/13/12	09/03/12
Potassium 40	-0.00509	U	0.543		1.19	08/13/12	09/03/12
Protactinium 231	0.206	U	0.531		1.51	08/13/12	09/03/12
Radium (226)	-0.0227	U	0.114	1.00	0.179	08/13/12	09/03/12
Radium 228	0.0744	U	0.0780		0.255	08/13/12	09/03/12
Thallium 208	-0.000524	U	0.0418		0.0858	08/13/12	09/03/12
Thorium 234	0.258	U	0.229		1.38	08/13/12	09/03/12
Uranium 235	0.0856	U	0.159		0.269	08/13/12	09/03/12
Uranium 238	0.258	U	0.229		1.38	08/13/12	09/03/12
Gamma Ra-226 & Hits By EML GA-01-R MOD			**pCi/g**	**Batch # 2226082**	**Yld %**		**F2H130000-082B**
Actinium 227	0.0120	U	0.0327		0.602	08/13/12	09/04/12
Actinium 228	0.0417	U	0.0920		0.253	08/13/12	09/04/12
Bismuth 212	0.0	U	0.139		1.07	08/13/12	09/04/12
Bismuth 214	-0.0490	U	1.96		0.326	08/13/12	09/04/12
Lead 210	0.895	U	1.37		2.66	08/13/12	09/04/12
Lead 212	-0.0438	U	0.349		0.173	08/13/12	09/04/12
Lead 214	0.0636	U	0.106		0.183	08/13/12	09/04/12
Potassium 40	-0.491	U	19.6		1.60	08/13/12	09/04/12
Protactinium 231	0.355	U	0.926		2.44	08/13/12	09/04/12
Radium (226)	-0.0490	U	1.96	1.00	0.326	08/13/12	09/04/12
Radium 228	0.0417	U	0.0920		0.253	08/13/12	09/04/12
Thallium 208	0.00874	U	0.0492		0.115	08/13/12	09/04/12
Thorium 234	-0.281	U	1.74		2.07	08/13/12	09/04/12
Uranium 235	0.0359	U	0.162		0.435	08/13/12	09/04/12
Uranium 238	-0.281	U	1.74		2.07	08/13/12	09/04/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined using instrument performance only
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Laboratory Control Sample Report

Radiochemistry

Client Lot ID: F2H090435
Matrix: SOLID

Parameter	Spike Amount	Result	Total Uncert. (2 σ+/-)	MDC	% Yld	% Rec	Lab Sample ID QC Control Limits
Gamma Ra-226 & Hits By EML GA-01-R MOD		**pCi/g**		**GA-01-R MOD**			**F2H130000-077C**
Radium (226)	12.2	10.1	1.52	0.673		83.0	(73.0 - 107)
Thorium 232	9.50	9.32	1.45	0.347		98.2	(82.0 - 126)
	Batch #:	2226077		**Analysis Date:**	09/03/12		
Gamma Ra-226 & Hits By EML GA-01-R MOD		**pCi/g**		**GA-01-R MOD**			**F2H130000-082C**
Radium (226)	12.2	11.4	1.51	0.503		93.5	(73.0 - 107)
Thorium 232	9.50	9.62	1.36	0.742		101	(82.0 - 126)
	Batch #:	2226082		**Analysis Date:**	09/04/12		

NOTE(S)

MDC is determined by instrument performance only
Calculations are performed before rounding to avoid round-off error in calculated results

DUPLICATE EVALUATION REPORT

Radiochemistry

Client Lot ID: F2H090435
Matrix: SOLID

Date Sampled: 08/01/12
Date Received: 08/09/12

Parameter	SAMPLE Result		Total Uncert. (2σ+/-)	% Yld	DUPLICATE Result		Total Uncert. (2 σ+/-)	% Yld	QC Sample ID Precision	
Gamma Ra-226 & Hits By EML GA-01-R MOD	**pCi/g**		**GA-01-R MOD**						**F2H090435-001**	
Actinium 227	0.0274	U	0.0897		-0.0185	U	0.566		1030	%RPD
Actinium 228	0.778		0.173		0.906		0.194		15.2	%RPD
Bismuth 212	0.469	U	0.336		0.454	U	0.441		3.38	%RPD
Bismuth 214	0.801		0.178		0.779		0.196		2.81	%RPD
Lead 210	0.248	U	1.14		0.578	U	1.33		80.1	%RPD
Lead 212	0.751		0.156		0.687		0.161		8.88	%RPD
Lead 214	0.868		0.193		0.858		0.165		1.10	%RPD
Potassium 40	17.9		2.55		20.8		3.07		15.2	%RPD
Protactinium 231	0.553	U	0.428		0.361	U	0.337		42.0	%RPD
Radium (226)	0.801		0.178		0.779		0.196		2.81	%RPD
Radium 228	0.778		0.173		0.906		0.194		15.2	%RPD
Thallium 208	0.232		0.0672		0.252		0.0797		8.47	%RPD
Thorium 234	1.21	U	1.14		0.349	U	0.696		110	%RPD
Uranium 235	0.0598	U	0.165		0.249	U	0.252		122	%RPD
Uranium 238	1.21	U	1.14		0.349	U	0.696		110	%RPD
	Batch #:		2226077	(Sample)	2226077		(Duplicate)			
Gamma Ra-226 & Hits By EML GA-01-R MOD	**pCi/g**		**GA-01-R MOD**						**F2H090435-017**	
Actinium 227	-0.770	U	0.626		0.0453	U	0.127		225	%RPD
Actinium 228	1.48		0.322		1.35		0.292		9.39	%RPD
Bismuth 212	1.17		0.642		0.620	U	0.496		61.1	%RPD
Bismuth 214	2.84		0.427		2.98		0.443		4.83	%RPD
Lead 210	2.32	U	2.06		1.35	U	1.99		53.2	%RPD
Lead 212	1.35		0.235		1.41		0.254		4.59	%RPD
Lead 214	3.37		0.446		3.30		0.451		2.18	%RPD
Potassium 40	20.8		3.17		20.6		3.16		1.19	%RPD
Protactinium 231	1.76	U	1.14		1.52	U	1.01		14.8	%RPD
Radium (226)	2.84		0.427		2.98		0.443		4.83	%RPD
Radium 228	1.48		0.322		1.35		0.292		9.39	%RPD
Thallium 208	0.549		0.122		0.497		0.118		9.92	%RPD
Thorium 234	0.772	U	0.856		0.839	U	0.708		8.25	%RPD
Uranium 235	0.0137	U	0.267		0.338	U	0.304		184	%RPD
Uranium 238	0.772	U	0.856		0.839	U	0.708		8.25	%RPD
	Batch #:		2226082	(Sample)	2226082		(Duplicate)			

NOTE(S)

Data are incomplete without the case narrative.
Calculations are performed before rounding to avoid round-off error in calculated results

U Result is less than the sample detection limit.

F2H090435

CLIENT ANALYSIS SUMMARY

Storage Loc: RAD

Project Manager: EKS
Quote #: 90680 SDG:
Project: RADIATION - STANDARD PRECISI
PO#: 10862434 EKS 8/14/12 Report to: EMILY FISHER
Client: 3333030 Tetra Tech, EMI (ARRA)
#SMPS In LOT: 29

Date Received: 2012-08-09
Analytical Due Date: 2012-09-07
Report Due Date: 2012-09-08
Report Type: B Standard Report
EDD Code: 00

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
1	EAST A			2012-08-01 / 1434	MV226	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
2	EAST D			2012-08-01 / 1440	MV228	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
3	PIPE #4			2012-08-03 / 1424	MV229	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
4	EAST B			2012-08-01 / 1436	MV23A	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
5	AREA 6 #2			2012-08-02 / 958	MV23C	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
6	AREA 3 #4			2012-08-03 / 1149	MV23E	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
7	AREA 3 #5			2012-08-03 / 1152	MV23F	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

F2H090435 CLIENT ANALYSIS SUMMARY

Storage Loc: RAD

Project Manager: EKS Quote #: 90680 SDG:

Project: RADIATION - STANDARD PRECISI

PO#: 1086243 Report to: EMILY FISHER

Client: 3333030 Tetra Tech, EMI (ARRA)

#SMPS In LOT: 29

Date Received: 2012-08-09

Analytical Due Date: 2012-09-07

Report Due Date: 2012-09-08

Report Type: B Standard Report

EDD Code: 00

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
8	SOUTH 2			2012-07-31 / 1602	MV23G	SOLID

SAMPLE COMMENTS:

XX ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX 0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
9	PIT-SOUTH			2012-07-30 / 1500	MV23H	SOLID

SAMPLE COMMENTS:

XX ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX 0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
10	PIPE #5			2012-08-03 / 1526	MV23J	SOLID

SAMPLE COMMENTS:

XX ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX 0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
11	AREA 6 #6			2012-08-02 / 1006	MV23K	SOLID

SAMPLE COMMENTS:

XX ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX 0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
12	AREA 6 #7R			2012-08-02 / 1400	MV23L	SOLID

SAMPLE COMMENTS:

XX ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX 0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
13	PIT-NORTH			2012-07-30 / 1342	MV23M	SOLID

SAMPLE COMMENTS:

XX ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX 0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
14	AREA 6#4			2012-08-02 / 1002	MV23N	SOLID

SAMPLE COMMENTS:

XX ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX 0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A

F2H090435 CLIENT ANALYSIS SUMMARY

Storage Loc: RAD
Date Received: 2012-08-09
Analytical Due Date: 2012-09-07
Report Due Date: 2012-09-08
Report Type: B Standard Report
EDD Code: 00

Project Manager: EKS
Quote #: 90680 SDG:
Project: RADIATION - STANDARD PRECISI
PO#: 1086243 Report to: EMILY FISHER
Client: 3333030 Tetra Tech, EMI (ARRA)
#SMPS In LOT: 29

15 PIPE #2 2012-08-03 / 1422 MV23P SOLID
SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE # | CLIENT SAMPLE ID | Site ID | Client Matrix | DATE/TIME SAMPLED | WORKORDER A

16 AREA 6 #5 2012-08-02 / 1004 MV23Q SOLID
SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE # | CLIENT SAMPLE ID | Site ID | Client Matrix | DATE/TIME SAMPLED | WORKORDER A

17 AREA 6 #1R 2012-08-02 / 1610 MV23R SOLID
SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE # | CLIENT SAMPLE ID | Site ID | Client Matrix | DATE/TIME SAMPLED | WORKORDER A

18 PIT-EAST 2012-07-30 / 1350 MV23T SOLID
SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE # | CLIENT SAMPLE ID | Site ID | Client Matrix | DATE/TIME SAMPLED | WORKORDER A

19 NORTH E 2012-08-01 / 1428 MV23V SOLID
SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE # | CLIENT SAMPLE ID | Site ID | Client Matrix | DATE/TIME SAMPLED | WORKORDER A

20 AREA 3 #2 2012-08-03 / 1144 MV23W SOLID
SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE # | CLIENT SAMPLE ID | Site ID | Client Matrix | DATE/TIME SAMPLED | WORKORDER A

21 PIPE #3 2012-08-03 / 1423 MV23X SOLID
SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE # | CLIENT SAMPLE ID | Site ID | Client Matrix | DATE/TIME SAMPLED | WORKORDER A

F2H090435 CLIENT ANALYSIS SUMMARY

Storage Loc: RAD

Project Manager: EKS Quote #: 90680 SDG: Date Received: 2012-08-09

Project: RADIATION - STANDARD PRECISI Analytical Due Date: 2012-09-07

PO#: 1086243 Report to: EMILY FISHER Report Due Date: 2012-09-08

Client: 3333030 Tetra Tech, EMI (ARRA) Report Type: B Standard Report

#SMPS In LOT: 29 EDD Code: 00

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
22	AREA 3 #3			2012-08-03 / 1147	MV230	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06	
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06	

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
23	SOUTH 1			2012-07-31 / 1604	MV231	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06	
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06	

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
24	EAST C			2012-08-01 / 1438	MV232	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06	
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06	

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
25	AREA 6 #4R			2012-08-02 / 1531	MV233	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06	
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06	

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
26	PIT WEST			2012-07-30 / 1347	MV234	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06	
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06	

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
27	NORTH D			2012-08-01 / 1426	MV235	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06	
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06	

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
28	NORTH F			2012-08-01 / 1431	MV236	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06	
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06	

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A

F2H090435

CLIENT ANALYSIS SUMMARY

Storage Loc: RAD

Project Manager: EKS
Quote #: 90680 SDG:
Project: RADIATION - STANDARD PRECISI
PO#: 1086243 Report to: EMILY FISHER
Client: 3333030 Tetra Tech, EMI (ARRA)
#SMPS In LOT: 29

Date Received: 2012-08-09
Analytical Due Date: 2012-09-07
Report Due Date: 2012-09-08
Report Type: B Standard Report
EDD Code: 00

29 PIPE #9 2012-08-03 / 1638 MV238 SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Phone 314.298.8566 fax 314.298.8757

CUR#188

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact		Project Manager: Rob Monnig	Site Contact:	Date:	COC No:
Tetra Tech		Tel/Fax: 816-729-5621	Lab Contact:	Carrier:	1 of 3 COCs
415 Oak Street		Analysis Turnaround Time			Job No.
Kansas City, MO		Calendar (C) or Work Days (W)			
(816) 412-1775	Phone	TAT if different from Below			
(xxx) xxx-xxxx	FAX	☐ 2 weeks			SDG No.
Project Name: Standard Precision		☐ 1 week			
Site:		☐ 2 days			
PO# 1086244		☐ 1 day			Sampler: Robert Monnig

Analysis: Filtered Sample; GAMMA SCAN w/ 21-day in-growth for Ra 226

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample	GAMMA SCAN w/ 21-day in-growth for Ra 226	Sample Specific Notes:
East A	8/1/12	1434			1		X	
East D	8/1/12	1440			1		X	
Pipe #4	8/3/12	1424			1		X	
East B	8/1/12	1436			1		X	
Area 6 #2	8/2/12	0958			1		X	
Area 3 #4	8/3/12	1149			1		X	
Area 3 #5	8/3/12	1152			1		X	
South 2	7/31/12	1602			1		X	
Pit - South	7/30/12	1500			1		X	
Pipe #5	8/3/12	1526			1		X	
Area 6 #6	8/2/12	1006			1		X	
Area 6 #7R	8/2/12	1400			1		X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ______

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* *Poison B* ☐ *Unknown* ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For ______ Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by: [signature]	Company: 8/7/12	Date/Time: 1652	Received by: FedEx	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by: Steven Clayton	Company: TestAmerica	Date/Time: 8/9/12 ~~1652~~ 0930 8/9/12 SC
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
phone 314.298.8566 fax 314.298.8757

CUR#188

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

Client Contact	Project Manager: Rob Monnig	Site Contact:	Date:	COC No:
Tetra Tech	Tel/Fax: 816-729-5621	Lab Contact:	Carrier:	2 of 3 COCs
415 Oak Street	Analysis Turnaround Time			Job No.
Kansas City, MO	Calendar (C) or Work Days (W)			
(816) 412-1775 Phone	TAT if different from Below			
(xxx) xxx-xxxx FAX	☐ 2 weeks			SDG No.
Project Name: Standard Precision	☐ 1 week			
Site:	☐ 2 days			
PO# 1086244	☐ 1 day			Sampler: Robert Monnig

Analysis: Filtered Sample; GAMMA SCAN w/ 21-day in-growth for Ra-226

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample	GAMMA SCAN w/ 21-day in-growth for Ra-226	Sample Specific Notes:
Pit - North	7/30/12	1342			1		X	
Area 6 #4	8/2/12	1002			1		X	
Pipe #2	8/3/12	1422			1		X	
Area 6 #5	8/2/12	1004			1		X	
Area 6 #1R	8/2/12	1010			1		X	
Pit - East	7/30/12	1350			1		X	
North E	8/1/12	1428			1		X	
Area 3 #2	8/3/12	1144			1		X	
Pipe #3	8/3/12	1423			1		X	
Area 3 #3	8/3/12	1147			1		X	
South 1	7/31/12	1604			1		X	
East C	8/1/12	1438			1		X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ______

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* *Poison B* ☐ *Unknown* ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For ______ Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	Tetra Tech	1657	FedEx		
Relinquished by:	Company:	Date/Time:	Received by: Steven Clayton	Company: TestAmerica	Date/Time: 8/9/12 ~~1657~~ 0930 8/9/12 SC
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Phone 314.298.8566 fax 314.298.8757

CUR #188

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

46 of 47

Client Contact	Project Manager: Rob Monnig	Site Contact:	Date:	COC No:
Tetra Tech	Tel/Fax: 816-729-5621	Lab Contact:	Carrier:	3 of 3 COCs
415 Oak Street	Analysis Turnaround Time			Job No.
Kansas City, MO	Calendar (C) or Work Days (W) _____			
(816) 412-1775 Phone	TAT if different from Below _____			SDG No.
(xxx) xxx-xxxx FAX	☐ 2 weeks			
Project Name: Standard Precision	☐ 1 week			Sampler: Robert Monnig
Site:	☐ 2 days			
PO# 10810244	☐ 1 day			Sample Specific Notes:

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample	GAMMA SCAN w/ 21-day in growth for Ra-226
Area 6 #4R	8/2/12	1531					X
Pit - West	7/30/12	1347					X
North D	8/1/12	1425					X
North F	8/1/12	1431					X
Pit #9	8/3/12	1638					X

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant Poison B ☐ Unknown ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
	8/7/12	1652	FedEx		
Relinquished by:	Company:	Date/Time:	Received by: Steven Clayton	Company: TestAmerica	Date/Time: 8/9/12 0830
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

F2H09435

TestAmerica St. Louis

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Lot #(s): F2H090435 / 439

CUR Form #: 188

CONDITION UPON RECEIPT FORM

Client: Tetra Tech

Quote No: ~~Tetra T~~ 90680

COC/RFA No: N/A

Initiated By: SC

Date: 8/9/12

Time: 1600 0930 8/9/12 SC

Shipping Information

Shipper: (FedEx) UPS DHL Courier Client Other: _____ Multiple Packages: (Y) N

Shipping # (s):*

1. 4465-1405-8866
2. 4465-1405-8888
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Sample Temperature (s):**

1. Ambient
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

*Numbered shipping lines correspond to Numbered Sample Temp lines

**Sample must be received at 4°C ± 2°C- If not, note contents below. Temperature variance does NOT affect the following: Metals-Liquid; Rad tests- Liquid or Solids; Perchlorate

Condition (Circle "Y" for yes, "N" for no and "N/A" for not applicable):

1.	(Y) N	Are there custody seals present on the cooler?	8.	Y (N)	Are there custody seals present on bottles?
2.	Y (N) N/A	Do custody seals on cooler appear to be tampered with?	9.	Y N (N/A)	Do custody seals on bottles appear to be tampered with?
3.	(Y) N	Were contents of cooler frisked after opening, but before unpacking?	10.	Y N (N/A)	Was sample received with proper pH[1]? (If not, make note below)
4.	(Y) N	Sample received with Chain of Custody?	11.	Y N (N/A)	Containers for C-14, H-3 & I-129/131 marked with "Do Not Preserve" label?
5.	(Y) N N/A	Does the Chain of Custody match sample ID's on the container(s)?	12.	(Y) N	Sample received in proper containers?
6.	Y (N)	Was sample received broken?	13.	Y N (N/A)	Headspace in VOA or TOX liquid samples? (If Yes, note sample ID's below)
7.	(Y) N	Is sample volume sufficient for analysis?	14.	Y N (N/A)	Was Internal COC/Workshare received?

[1] For DOE-AL (Pantex, LANL, Sandia) sites, pH of ALL containers received must be verified, EXCEPT VOA, TOX, Oil & Grease and soils.

Notes:

Standard Products and Standard Precision

Lid was loose on pit-north and area 6-4R
Lid was completely off on pit-east
Samples were not compromised as 8/9/12

Corrective Action:

- ☐ Client Contact Name: _____ Informed by: _____
- ☐ Sample(s) processed "as is"
- ☐ Sample(s) on hold until: _____ If released, notify: _____

Project Management Review: GW Date: 8/14/12

THIS FORM MUST BE COMPLETED AT THE TIME THE ITEMS ARE BEING CHECKED IN. IF ANY ITEM IS COMPLETED BY SOMEONE OTHER THAN THE INITIATOR, THEN THAT PERSON IS REQUIRED TO APPLY THEIR INITIAL AND THE DATE NEXT TO THAT ITEM.

ADMIN-0004 rev13, REVISED 05/27/11 \\Slsvr01\QA\FORMS\ST-LOUIS\ADMIN\Admin-0004 CUR.doc

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TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

ANALYTICAL REPORT

Radiation - Standard Precision

Lot #: F2H270452

Rob Monning

Tetra Tech, EMI ARRA
415 Oak Street
Kansas City, MO 64106

TESTAMERICA LABORATORIES, INC.

Erika Starman
Project Manager

September 24, 2012

13715 Rider Trail North Earth City, MO 63045 **tel** 314.298.8566 **fax** 314.298.8757 **www.testamericainc.com**

Case Narrative
LOT NUMBER: F2H270452

This report contains the analytical results for the 30 samples received under chain of custody by TestAmerica St. Louis on August 27, 2012. These samples are associated with your Radiation - Standard Precision project.

The analytical results included in this report meet all applicable quality control procedure requirements.

The test results in this report meet all NELAP requirements for parameters in which accreditations are held by TestAmerica St. Louis. Any exceptions to NELAP requirements are noted in the case narrative. **TestAmerica St. Louis' Florida certification number is E87689.** The case narrative is an integral part of this report.

This report shall not be reproduced, except in full, without the written approval of the laboratory.

All chemical analysis results are based upon sample as received, wet weight, unless noted otherwise. All radiochemistry results are based upon sample as dried and ground with the exception of tritium, unless requested wet weight by the client.

Observations/Nonconformances

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

There were no nonconformances or observations noted with any analysis on this lot.

METHODS SUMMARY

F2H270452

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
Gamma Spectroscopy - Radium-226 & Hits	EML GA-01-R MOD	

References:

EML "ENVIRONMENTAL MEASUREMENTS LABORATORY PROCEDURES MANUAL" HASL-300 28TH EDITION, VOLUME I and II DEPARTMENT OF ENERGY

SAMPLE SUMMARY

F2H270452

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
MWA8P	001	REF-1	08/04/12	09:23
MWA8Q	002	REF-2	08/04/12	09:25
MWA8R	003	REF-3	08/04/12	09:27
MWA8T	004	REF-4	08/04/12	09:29
MWA8V	005	REF-5	08/04/12	09:32
MWA8W	006	REF-6	08/04/12	09:34
MWA8X	007	REF-7	08/04/12	09:37
MWA80	008	PIPE #1	08/03/12	14:06
MWA81	009	PIPE #6	08/03/12	15:30
MWA82	010	PIPE #7	08/03/12	15:58
MWA83	011	PIPE #8	08/03/12	16:37
MWA84	012	PIPE #10	08/03/12	17:16
MWA85	013	AREA 3 #1	08/03/12	11:39
MWA86	014	AREA 3 #6	08/03/12	11:54
MWA87	015	AREA 3 #7R	08/03/12	17:17
MWA88	016	AREA 1	08/03/12	17:26
MWA89	017	AREA 5	08/01/12	17:04
MWA9A	018	AREA 6 #3	08/02/12	10:00
MWA9C	019	SOUTH 3	07/31/12	16:15
MWA9D	020	SOUTH 4	07/31/12	16:08
MWA9E	021	SOUTH 5	07/31/12	16:20
MWA9F	022	WEST A	08/01/12	11:12
MWA9G	023	WEST B	08/01/12	11:14
MWA9H	024	WEST D	08/01/12	11:20
MWA9J	025	WEST E	08/01/12	11:27
MWA9K	026	WEST C	08/01/12	11:24
MWA9L	027	WEST F	08/01/12	11:30
MWA9M	028	NORTH C	08/01/12	11:17
MWA9N	029	NORTH A	08/01/12	11:36
MWA9P	030	NORTH B	08/01/12	11:42

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

Tetra Tech, EMI (ARRA)

Client Sample ID: REF-1

Radiochemistry

Lab Sample ID: F2H270452-001
Work Order: MWA8P
Matrix: SOLID

Date Collected: 08/04/12 0923
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	0.09	U	0.24		1.0	08/29/12	09/19/12
Actinium 228	**0.59**		**0.19**		**0.11**	**08/29/12**	**09/19/12**
Bismuth 212	0.22	U	0.30		0.50	08/29/12	09/19/12
Bismuth 214	**0.69**		**0.16**		**0.12**	**08/29/12**	**09/19/12**
Lead 210	**2.5**		**1.2**		**1.6**	**08/29/12**	**09/19/12**
Lead 212	**0.50**		**0.11**		**0.1**	**08/29/12**	**09/19/12**
Lead 214	**0.62**		**0.16**		**0.14**	**08/29/12**	**09/19/12**
Potassium 40	**17.0**		**2.4**		**0.8**	**08/29/12**	**09/19/12**
Protactinium 231	0.39	U	0.52		1.6	08/29/12	09/19/12
Radium (226)	**0.69**		**0.16**	1.00	**0.12**	**08/29/12**	**09/19/12**
Radium 228	**0.59**		**0.19**		**0.11**	**08/29/12**	**09/19/12**
Thallium 208	**0.120**		**0.055**		**0.074**	**08/29/12**	**09/19/12**
Thorium 234	0.33	U	0.39		1.7	08/29/12	09/19/12
Uranium 235	0.12	U	0.22		0.37	08/29/12	09/19/12
Uranium 238	0.33	U	0.39		1.7	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: REF-1 DUP

Radiochemistry

Lab Sample ID: F2H270452-001X
Work Order: MWA8P
Matrix: SOLID

Date Collected: 08/04/12 0923
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-0.35	U	0.60		0.99	08/29/12	09/19/12
Actinium 228	**0.65**		**0.21**		**0.33**	**08/29/12**	**09/19/12**
Bismuth 212	0.0	U	0.46		0.72	08/29/12	09/19/12
Bismuth 214	**0.75**		**0.22**		**0.18**	**08/29/12**	**09/19/12**
Lead 210	1	U	1.6		2.8	08/29/12	09/19/12
Lead 212	**0.49**		**0.18**		**0.18**	**08/29/12**	**09/19/12**
Lead 214	**0.91**		**0.20**		**0.15**	**08/29/12**	**09/19/12**
Potassium 40	**16.5**		**3.0**		**1.1**	**08/29/12**	**09/19/12**
Protactinium 231	0.0	U	1.2		2.9	08/29/12	09/19/12
Radium (226)	**0.75**		**0.22**	1.00	**0.18**	**08/29/12**	**09/19/12**
Radium 228	**0.65**		**0.21**		**0.33**	**08/29/12**	**09/19/12**
Thallium 208	**0.173**		**0.078**		**0.083**	**08/29/12**	**09/19/12**
Thorium 234	0.7	U	1.4		2.4	08/29/12	09/19/12
Uranium 235	0.15	U	0.26		0.49	08/29/12	09/19/12
Uranium 238	0.7	U	1.4		2.4	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: REF-2

Radiochemistry

Lab Sample ID: F2H270452-002
Work Order: MWA8Q
Matrix: SOLID

Date Collected: 08/04/12 0925
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-0.06	U	0.17		0.72	08/29/12	09/19/12
Actinium 228	**0.51**		**0.26**		**0.44**	**08/29/12**	**09/19/12**
Bismuth 212	0.39	U	0.69		1.2	08/29/12	09/19/12
Bismuth 214	**1.12**		**0.27**		**0.14**	**08/29/12**	**09/19/12**
Lead 210	1.8	U	1.8		2.9	08/29/12	09/19/12
Lead 212	**0.76**		**0.22**		**0.21**	**08/29/12**	**09/19/12**
Lead 214	**1.35**		**0.29**		**0.16**	**08/29/12**	**09/19/12**
Potassium 40	**13.5**		**2.9**		**1.3**	**08/29/12**	**09/19/12**
Protactinium 231	0.7	U	1.8		3.2	08/29/12	09/19/12
Radium (226)	**1.12**		**0.27**	1.00	**0.14**	**08/29/12**	**09/19/12**
Radium 228	**0.51**		**0.26**		**0.44**	**08/29/12**	**09/19/12**
Thallium 208	**0.35**		**0.11**		**0.08**	**08/29/12**	**09/19/12**
Thorium 234	0.66	U	0.90		2.9	08/29/12	09/19/12
Uranium 235	0.40	U	0.33		0.54	08/29/12	09/19/12
Uranium 238	0.66	U	0.90		2.9	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: REF-3

Radiochemistry

Lab Sample ID: F2H270452-003
Work Order: MWA8R
Matrix: SOLID

Date Collected: 08/04/12 0927
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-0.04	U	0.41		0.70	08/29/12	09/19/12
Actinium 228	0.31	U	0.16		0.40	08/29/12	09/19/12
Bismuth 212	0.14	U	0.51		0.90	08/29/12	09/19/12
Bismuth 214	**1.44**		**0.30**		**0.18**	**08/29/12**	**09/19/12**
Lead 210	**3.2**		**2.0**		**2.4**	**08/29/12**	**09/19/12**
Lead 212	**0.36**		**0.12**		**0.12**	**08/29/12**	**09/19/12**
Lead 214	**1.58**		**0.27**		**0.17**	**08/29/12**	**09/19/12**
Potassium 40	**6.5**		**1.6**		**0.9**	**08/29/12**	**09/19/12**
Protactinium 231	0.31	U	0.31		2.4	08/29/12	09/19/12
Radium (226)	**1.44**		**0.30**	1.00	**0.18**	**08/29/12**	**09/19/12**
Radium 228	0.31	U	0.16		0.40	08/29/12	09/19/12
Thallium 208	**0.121**		**0.061**		**0.059**	**08/29/12**	**09/19/12**
Thorium 234	**2.1**		**1.5**		**1.9**	**08/29/12**	**09/19/12**
Uranium 235	0.16	U	0.25		0.50	08/29/12	09/19/12
Uranium 238	**2.1**		**1.5**		**1.9**	**08/29/12**	**09/19/12**

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: REF-4

Radiochemistry

Lab Sample ID: F2H270452-004
Work Order: MWA8T
Matrix: SOLID

Date Collected: 08/04/12 0929
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-0.15	U	0.29		0.49	08/29/12	09/19/12
Actinium 228	**1.02**		**0.27**		**0.11**	**08/29/12**	**09/19/12**
Bismuth 212	0.25	U	0.43		0.73	08/29/12	09/19/12
Bismuth 214	**1.11**		**0.21**		**0.09**	**08/29/12**	**09/19/12**
Lead 210	**3.4**		**1.7**		**2.2**	**08/29/12**	**09/19/12**
Lead 212	**0.81**		**0.16**		**0.13**	**08/29/12**	**09/19/12**
Lead 214	**1.17**		**0.21**		**0.11**	**08/29/12**	**09/19/12**
Potassium 40	**14.6**		**2.4**		**1**	**08/29/12**	**09/19/12**
Protactinium 231	0.47	U	0.39		2.2	08/29/12	09/19/12
Radium (226)	**1.11**		**0.21**	1.00	**0.09**	**08/29/12**	**09/19/12**
Radium 228	**1.02**		**0.27**		**0.11**	**08/29/12**	**09/19/12**
Thallium 208	**0.300**		**0.079**		**0.050**	**08/29/12**	**09/19/12**
Thorium 234	0.51	U	0.41		2.0	08/29/12	09/19/12
Uranium 235	0.17	U	0.23		0.41	08/29/12	09/19/12
Uranium 238	0.51	U	0.41		2.0	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: REF-5

Radiochemistry

Lab Sample ID: F2H270452-005
Work Order: MWA8V
Matrix: SOLID

Date Collected: 08/04/12 0932
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-0.32	U	0.53		0.88	08/29/12	09/19/12
Actinium 228	**0.87**		**0.24**		**0.11**	**08/29/12**	**09/19/12**
Bismuth 212	0.18	U	0.37		0.64	08/29/12	09/19/12
Bismuth 214	**1.07**		**0.21**		**0.08**	**08/29/12**	**09/19/12**
Lead 210	0.9	U	1.3		2.2	08/29/12	09/19/12
Lead 212	**0.54**		**0.14**		**0.14**	**08/29/12**	**09/19/12**
Lead 214	**1.15**		**0.21**		**0.11**	**08/29/12**	**09/19/12**
Potassium 40	**13.5**		**2.3**		**0.7**	**08/29/12**	**09/19/12**
Protactinium 231	0.59	U	0.76		1.7	08/29/12	09/19/12
Radium (226)	**1.07**		**0.21**	1.00	**0.08**	**08/29/12**	**09/19/12**
Radium 228	**0.87**		**0.24**		**0.11**	**08/29/12**	**09/19/12**
Thallium 208	**0.152**		**0.061**		**0.069**	**08/29/12**	**09/19/12**
Thorium 234	1.20	U	0.63		2.1	08/29/12	09/19/12
Uranium 235	0.09	U	0.29		0.50	08/29/12	09/19/12
Uranium 238	1.20	U	0.63		2.1	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: REF-6

Radiochemistry

Lab Sample ID: F2H270452-006
Work Order: MWA8W
Matrix: SOLID

Date Collected: 08/04/12 0934
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-0.44	U	0.46		0.75	08/29/12	09/19/12
Actinium 228	**0.38**		**0.16**		**0.30**	**08/29/12**	**09/19/12**
Bismuth 212	0.28	U	0.40		0.67	08/29/12	09/19/12
Bismuth 214	**1.50**		**0.26**		**0.14**	**08/29/12**	**09/19/12**
Lead 210	**4.3**		**2.0**		**2.5**	**08/29/12**	**09/19/12**
Lead 212	**0.38**		**0.11**		**0.12**	**08/29/12**	**09/19/12**
Lead 214	**1.68**		**0.26**		**0.17**	**08/29/12**	**09/19/12**
Potassium 40	**9.0**		**1.7**		**0.6**	**08/29/12**	**09/19/12**
Protactinium 231	0.17	U	0.30		2.4	08/29/12	09/19/12
Radium (226)	**1.50**		**0.26**	1.00	**0.14**	**08/29/12**	**09/19/12**
Radium 228	**0.38**		**0.16**		**0.30**	**08/29/12**	**09/19/12**
Thallium 208	**0.220**		**0.071**		**0.064**	**08/29/12**	**09/19/12**
Thorium 234	1.83	U	0.74		2.1	08/29/12	09/19/12
Uranium 235	0.17	U	0.27		0.46	08/29/12	09/19/12
Uranium 238	1.83	U	0.74		2.1	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: REF-7

Radiochemistry

Lab Sample ID: F2H270452-007
Work Order: MWA8X
Matrix: SOLID

Date Collected: 08/04/12 0937
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-0.39	U	0.39		0.64	08/29/12	09/19/12
Actinium 228	**0.63**		**0.14**		**0.10**	**08/29/12**	**09/19/12**
Bismuth 212	0.02	U	0.22		0.40	08/29/12	09/19/12
Bismuth 214	**0.95**		**0.19**		**0.12**	**08/29/12**	**09/19/12**
Lead 210	**3.7**		**1.8**		**1.7**	**08/29/12**	**09/19/12**
Lead 212	**0.56**		**0.12**		**0.10**	**08/29/12**	**09/19/12**
Lead 214	**1.06**		**0.18**		**0.11**	**08/29/12**	**09/19/12**
Potassium 40	**14.9**		**2.1**		**0.5**	**08/29/12**	**09/19/12**
Protactinium 231	0.14	U	0.16		1.7	08/29/12	09/19/12
Radium (226)	**0.95**		**0.19**	1.00	**0.12**	**08/29/12**	**09/19/12**
Radium 228	**0.63**		**0.14**		**0.10**	**08/29/12**	**09/19/12**
Thallium 208	**0.213**		**0.058**		**0.037**	**08/29/12**	**09/19/12**
Thorium 234	0.55	U	0.41		1.7	08/29/12	09/19/12
Uranium 235	0.1	U	0.22		0.37	08/29/12	09/19/12
Uranium 238	0.55	U	0.41		1.7	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIPE #1

Radiochemistry

Lab Sample ID: F2H270452-008
Work Order: MWA80
Matrix: SOLID

Date Collected: 08/03/12 1406
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	0.0	U	0.31		0.53	08/29/12	09/19/12
Actinium 228	**0.91**		**0.25**		**0.23**	**08/29/12**	**09/19/12**
Bismuth 212	0.16	U	0.43		0.75	08/29/12	09/19/12
Bismuth 214	**3.45**		**0.47**		**0.16**	**08/29/12**	**09/19/12**
Lead 210	0.3	U	1.4		2.5	08/29/12	09/19/12
Lead 212	**0.68**		**0.15**		**0.14**	**08/29/12**	**09/19/12**
Lead 214	**3.61**		**0.45**		**0.19**	**08/29/12**	**09/19/12**
Potassium 40	**21.4**		**3.0**		**0.6**	**08/29/12**	**09/19/12**
Protactinium 231	-0.7	U	1.5		2.5	08/29/12	09/19/12
Radium (226)	**3.45**		**0.47**	1.00	**0.16**	**08/29/12**	**09/19/12**
Radium 228	**0.91**		**0.25**		**0.23**	**08/29/12**	**09/19/12**
Thallium 208	**0.238**		**0.085**		**0.085**	**08/29/12**	**09/19/12**
Thorium 234	0.39	U	0.74		2.3	08/29/12	09/19/12
Uranium 235	0.32	U	0.36		0.56	08/29/12	09/19/12
Uranium 238	0.39	U	0.74		2.3	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIPE #6

Radiochemistry

Lab Sample ID: F2H270452-009
Work Order: MWA81
Matrix: SOLID

Date Collected: 08/03/12 1530
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	0.08	U	0.24		0.96	08/29/12	09/19/12
Actinium 228	**0.85**		**0.21**		**0.24**	**08/29/12**	**09/19/12**
Bismuth 212	**0.80**		**0.35**		**0.31**	**08/29/12**	**09/19/12**
Bismuth 214	**0.66**		**0.18**		**0.15**	**08/29/12**	**09/19/12**
Lead 210	0.2	U	1.3		2.4	08/29/12	09/19/12
Lead 212	**0.60**		**0.16**		**0.15**	**08/29/12**	**09/19/12**
Lead 214	**0.79**		**0.16**		**0.15**	**08/29/12**	**09/19/12**
Potassium 40	**21.6**		**2.9**		**0.8**	**08/29/12**	**09/19/12**
Protactinium 231	0.20	U	0.73		1.3	08/29/12	09/19/12
Radium (226)	**0.66**		**0.18**	1.00	**0.15**	**08/29/12**	**09/19/12**
Radium 228	**0.85**		**0.21**		**0.24**	**08/29/12**	**09/19/12**
Thallium 208	**0.203**		**0.078**		**0.082**	**08/29/12**	**09/19/12**
Thorium 234	1	U	1.2		1.7	08/29/12	09/19/12
Uranium 235	0.17	U	0.25		0.41	08/29/12	09/19/12
Uranium 238	1	U	1.2		1.7	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIPE #7

Radiochemistry

Lab Sample ID: F2H270452-010
Work Order: MWA82
Matrix: SOLID

Date Collected: 08/03/12 1558
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	/ mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-0.30	U	0.42		0.70	08/29/12	09/19/12
Actinium 228	**1.06**		0.27		0.22	08/29/12	09/19/12
Bismuth 212	**1.59**		0.53		0.29	08/29/12	09/19/12
Bismuth 214	**1.12**		0.26		0.18	08/29/12	09/19/12
Lead 210	**2.5**		1.5		2.0	08/29/12	09/19/12
Lead 212	**1.00**		0.20		0.12	08/29/12	09/19/12
Lead 214	**1.16**		0.25		0.18	08/29/12	09/19/12
Potassium 40	**19.9**		3.2		0.9	08/29/12	09/19/12
Protactinium 231	1.3	U	1.1		2.4	08/29/12	09/19/12
Radium (226)	**1.12**		0.26	1.00	0.18	08/29/12	09/19/12
Radium 228	**1.06**		0.27		0.22	08/29/12	09/19/12
Thallium 208	**0.36**		0.11		0.08	08/29/12	09/19/12
Thorium 234	1.5	U	1.4		2.3	08/29/12	09/19/12
Uranium 235	0.25	U	0.27		0.54	08/29/12	09/19/12
Uranium 238	1.5	U	1.4		2.3	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIPE #8

Radiochemistry

Lab Sample ID: F2H270452-011
Work Order: MWA83
Matrix: SOLID

Date Collected: 08/03/12 1637
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	0.03	U	0.58		0.99	08/29/12	09/19/12
Actinium 228	**0.84**		**0.21**		**0.19**	**08/29/12**	**09/19/12**
Bismuth 212	0.26	U	0.37		0.61	08/29/12	09/19/12
Bismuth 214	**0.91**		**0.17**		**0.06**	**08/29/12**	**09/19/12**
Lead 210	**3.6**		**1.6**		**2.0**	**08/29/12**	**09/19/12**
Lead 212	**0.58**		**0.12**		**0.09**	**08/29/12**	**09/19/12**
Lead 214	**0.98**		**0.18**		**0.11**	**08/29/12**	**09/19/12**
Potassium 40	**20.0**		**2.9**		**0.5**	**08/29/12**	**09/19/12**
Protactinium 231	0.28	U	0.46		1.5	08/29/12	09/19/12
Radium (226)	**0.91**		**0.17**	1.00	**0.06**	**08/29/12**	**09/19/12**
Radium 228	**0.84**		**0.21**		**0.19**	**08/29/12**	**09/19/12**
Thallium 208	**0.293**		**0.080**		**0.058**	**08/29/12**	**09/19/12**
Thorium 234	**1.5**		**1.1**		**1.4**	**08/29/12**	**09/19/12**
Uranium 235	0.11	U	0.20		0.33	08/29/12	09/19/12
Uranium 238	**1.5**		**1.1**		**1.4**	**08/29/12**	**09/19/12**

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: PIPE #10

Radiochemistry

Lab Sample ID: F2H270452-012
Work Order: MWA84
Matrix: SOLID

Date Collected: 08/03/12 1716
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-0.37	U	0.53		0.87	08/29/12	09/19/12
Actinium 228	**0.97**		**0.28**		**0.29**	**08/29/12**	**09/19/12**
Bismuth 212	0.28	U	0.44		0.74	08/29/12	09/19/12
Bismuth 214	**1.48**		**0.30**		**0.16**	**08/29/12**	**09/19/12**
Lead 210	**3.1**		**2.0**		**3.0**	**08/29/12**	**09/19/12**
Lead 212	**0.85**		**0.19**		**0.15**	**08/29/12**	**09/19/12**
Lead 214	**1.68**		**0.28**		**0.17**	**08/29/12**	**09/19/12**
Potassium 40	**21.2**		**3.3**		**0.8**	**08/29/12**	**09/19/12**
Protactinium 231	0.047	U	0.065		3.0	08/29/12	09/19/12
Radium (226)	**1.48**		**0.30**	1.00	**0.16**	**08/29/12**	**09/19/12**
Radium 228	**0.97**		**0.28**		**0.29**	**08/29/12**	**09/19/12**
Thallium 208	**0.34**		**0.10**		**0.08**	**08/29/12**	**09/19/12**
Thorium 234	0.49	U	0.84		2.8	08/29/12	09/19/12
Uranium 235	0.26	U	0.32		0.53	08/29/12	09/19/12
Uranium 238	0.49	U	0.84		2.8	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 3 #1

Radiochemistry

Lab Sample ID: F2H270452-013
Work Order: MWA85
Matrix: SOLID

Date Collected: 08/03/12 1139
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	0.17	U	0.24		1.1	08/29/12	09/19/12
Actinium 228	**0.70**		**0.19**		**0.19**	**08/29/12**	**09/19/12**
Bismuth 212	0.44	U	0.32		0.46	08/29/12	09/19/12
Bismuth 214	**1.23**		**0.22**		**0.11**	**08/29/12**	**09/19/12**
Lead 210	1.9	U	1.4		2.0	08/29/12	09/19/12
Lead 212	**0.54**		**0.12**		**0.13**	**08/29/12**	**09/19/12**
Lead 214	**1.27**		**0.22**		**0.13**	**08/29/12**	**09/19/12**
Potassium 40	**19.9**		**2.8**		**0.7**	**08/29/12**	**09/19/12**
Protactinium 231	0.53	U	0.83		1.8	08/29/12	09/19/12
Radium (226)	**1.23**		**0.22**	1.00	**0.11**	**08/29/12**	**09/19/12**
Radium 228	**0.70**		**0.19**		**0.19**	**08/29/12**	**09/19/12**
Thallium 208	**0.102**		**0.058**		**0.085**	**08/29/12**	**09/19/12**
Thorium 234	-0.03	U	0.19		2.1	08/29/12	09/19/12
Uranium 235	0.26	U	0.23		0.38	08/29/12	09/19/12
Uranium 238	-0.03	U	0.19		2.1	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 3 #6

Radiochemistry

Lab Sample ID: F2H270452-014
Work Order: MWA86
Matrix: SOLID

Date Collected: 08/03/12 1154
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-0.02	U	0.19		1.5	08/29/12	09/19/12
Actinium 228	**1.32**		**0.26**		**0.16**	**08/29/12**	**09/19/12**
Bismuth 212	0.32	U	0.42		0.70	08/29/12	09/19/12
Bismuth 214	**0.80**		**0.21**		**0.18**	**08/29/12**	**09/19/12**
Lead 210	1.1	U	1.6		2.5	08/29/12	09/19/12
Lead 212	**0.90**		**0.17**		**0.13**	**08/29/12**	**09/19/12**
Lead 214	**0.93**		**0.17**		**0.15**	**08/29/12**	**09/19/12**
Potassium 40	**21.2**		**3.0**		**0.5**	**08/29/12**	**09/19/12**
Protactinium 231	0.58	U	0.48		2.3	08/29/12	09/19/12
Radium (226)	**0.80**		**0.21**	1.00	**0.18**	**08/29/12**	**09/19/12**
Radium 228	**1.32**		**0.26**		**0.16**	**08/29/12**	**09/19/12**
Thallium 208	**0.340**		**0.094**		**0.082**	**08/29/12**	**09/19/12**
Thorium 234	1.9	U	1.7		2.1	08/29/12	09/19/12
Uranium 235	0.09	U	0.22		0.43	08/29/12	09/19/12
Uranium 238	1.9	U	1.7		2.1	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 3 #7R

Radiochemistry

Lab Sample ID: F2H270452-015
Work Order: MWA87
Matrix: SOLID

Date Collected: 08/03/12 1717
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-0.66	U	0.56		0.90	08/29/12	09/19/12
Actinium 228	**1.43**		**0.27**		**0.08**	**08/29/12**	**09/19/12**
Bismuth 212	**1.29**		**0.43**		**0.28**	**08/29/12**	**09/19/12**
Bismuth 214	**0.91**		**0.19**		**0.14**	**08/29/12**	**09/19/12**
Lead 210	-0.9	U	1.5		2.4	08/29/12	09/19/12
Lead 212	**1.00**		**0.22**		**0.17**	**08/29/12**	**09/19/12**
Lead 214	**1.21**		**0.22**		**0.16**	**08/29/12**	**09/19/12**
Potassium 40	**21.2**		**2.9**		**0.7**	**08/29/12**	**09/19/12**
Protactinium 231	0.70	U	0.46		2.6	08/29/12	09/19/12
Radium (226)	**0.91**		**0.19**	1.00	**0.14**	**08/29/12**	**09/19/12**
Radium 228	**1.43**		**0.27**		**0.08**	**08/29/12**	**09/19/12**
Thallium 208	**0.51**		**0.11**		**0.06**	**08/29/12**	**09/19/12**
Thorium 234	0.9	U	1.3		2.1	08/29/12	09/19/12
Uranium 235	0.09	U	0.29		0.50	08/29/12	09/19/12
Uranium 238	0.9	U	1.3		2.1	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 1

Radiochemistry

Lab Sample ID: F2H270452-016
Work Order: MWA88
Matrix: SOLID

Date Collected: 08/03/12 1726
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-0.88	U	0.66		1.1	08/29/12	09/19/12
Actinium 228	**0.55**		**0.24**		**0.27**	**08/29/12**	**09/19/12**
Bismuth 212	0.60	U	0.53		0.84	08/29/12	09/19/12
Bismuth 214	**7.00**		**0.86**		**0.23**	**08/29/12**	**09/19/12**
Lead 210	**3.4**		**1.8**		**2.6**	**08/29/12**	**09/19/12**
Lead 212	**0.80**		**0.18**		**0.18**	**08/29/12**	**09/19/12**
Lead 214	**7.23**		**0.83**		**0.23**	**08/29/12**	**09/19/12**
Potassium 40	**20.6**		**3.0**		**0.8**	**08/29/12**	**09/19/12**
Protactinium 231	0.39	U	0.83		2.6	08/29/12	09/19/12
Radium (226)	**7.00**		**0.86**	1.00	**0.23**	**08/29/12**	**09/19/12**
Radium 228	**0.55**		**0.24**		**0.27**	**08/29/12**	**09/19/12**
Thallium 208	**0.160**		**0.091**		**0.14**	**08/29/12**	**09/19/12**
Thorium 234	0.35	U	0.87		3.2	08/29/12	09/19/12
Uranium 235	-0.1	U	0.45		0.75	08/29/12	09/19/12
Uranium 238	0.35	U	0.87		3.2	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 5

Radiochemistry

Lab Sample ID: F2H270452-017
Work Order: MWA89
Matrix: SOLID

Date Collected: 08/01/12 1704
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-0.05	U	0.75		1.3	08/29/12	09/19/12
Actinium 228	**1.13**		0.26		0.25	08/29/12	09/19/12
Bismuth 212	**0.68**		0.44		0.64	08/29/12	09/19/12
Bismuth 214	**1.55**		0.30		0.17	08/29/12	09/19/12
Lead 210	**3.6**		2.1		2.6	08/29/12	09/19/12
Lead 212	**1.16**		0.21		0.15	08/29/12	09/19/12
Lead 214	**1.50**		0.26		0.15	08/29/12	09/19/12
Potassium 40	**17.3**		2.6		1.1	08/29/12	09/19/12
Protactinium 231	0.33	U	0.30		2.6	08/29/12	09/19/12
Radium (226)	**1.55**		0.30	1.00	0.17	08/29/12	09/19/12
Radium 228	**1.13**		0.26		0.25	08/29/12	09/19/12
Thallium 208	**0.347**		0.088		0.074	08/29/12	09/19/12
Thorium 234	1.4	U	1.7		2.3	08/29/12	09/19/12
Uranium 235	0.15	U	0.40		0.58	08/29/12	09/19/12
Uranium 238	1.4	U	1.7		2.3	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: AREA 6 #3

Radiochemistry

Lab Sample ID: F2H270452-018
Work Order: MWA9A
Matrix: SOLID

Date Collected: 08/02/12 1000
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	-1.22	U	0.77		1.2	08/29/12	09/19/12
Actinium 228	**1.24**		**0.31**		**0.26**	**08/29/12**	**09/19/12**
Bismuth 212	**1.27**		**0.50**		**0.44**	**08/29/12**	**09/19/12**
Bismuth 214	**5.84**		**0.74**		**0.21**	**08/29/12**	**09/19/12**
Lead 210	**6.3**		**2.9**		**3.4**	**08/29/12**	**09/19/12**
Lead 212	**1.04**		**0.20**		**0.18**	**08/29/12**	**09/19/12**
Lead 214	**6.02**		**0.71**		**0.21**	**08/29/12**	**09/19/12**
Potassium 40	**20.3**		**2.9**		**0.8**	**08/29/12**	**09/19/12**
Protactinium 231	-0.09	U	2.1		3.6	08/29/12	09/19/12
Radium (226)	**5.84**		**0.74**	1.00	**0.21**	**08/29/12**	**09/19/12**
Radium 228	**1.24**		**0.31**		**0.26**	**08/29/12**	**09/19/12**
Thallium 208	**0.38**		**0.13**		**0.11**	**08/29/12**	**09/19/12**
Thorium 234	0.87	U	0.61		3.3	08/29/12	09/19/12
Uranium 235	-0.02	U	0.45		0.76	08/29/12	09/19/12
Uranium 238	0.87	U	0.61		3.3	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: SOUTH 3

Radiochemistry

Lab Sample ID: F2H270452-019
Work Order: MWA9C
Matrix: SOLID

Date Collected: 07/31/12 1615
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	0.11	U	0.58		1.0	08/29/12	09/19/12
Actinium 228	0.49	U	0.38		0.58	08/29/12	09/19/12
Bismuth 212	0.24	U	0.71		1.3	08/29/12	09/19/12
Bismuth 214	**5.84**		**0.84**		**0.28**	**08/29/12**	**09/19/12**
Lead 210	**7.3**		**3.8**		**4.6**	**08/29/12**	**09/19/12**
Lead 212	**0.51**		**0.18**		**0.24**	**08/29/12**	**09/19/12**
Lead 214	**6.15**		**0.81**		**0.27**	**08/29/12**	**09/19/12**
Potassium 40	**8.4**		**2.2**		**1.3**	**08/29/12**	**09/19/12**
Protactinium 231	1.7	U	1.8		3.9	08/29/12	09/19/12
Radium (226)	**5.84**		**0.84**	1.00	**0.28**	**08/29/12**	**09/19/12**
Radium 228	0.49	U	0.38		0.58	08/29/12	09/19/12
Thallium 208	0.081	U	0.096		0.16	08/29/12	09/19/12
Thorium 234	0.5	U	1.1		3.8	08/29/12	09/19/12
Uranium 235	0.08	U	0.63		1.1	08/29/12	09/19/12
Uranium 238	0.5	U	1.1		3.8	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: SOUTH 4

Radiochemistry

Lab Sample ID: F2H270452-020
Work Order: MWA9D
Matrix: SOLID

Date Collected: 07/31/12 1608
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081		Yld %
Actinium 227	0.21	U	0.28		1.0	08/29/12	09/19/12
Actinium 228	0.19	U	0.19		0.39	08/29/12	09/19/12
Bismuth 212	0.24	U	0.46		0.80	08/29/12	09/19/12
Bismuth 214	**2.93**		**0.44**		**0.16**	**08/29/12**	**09/19/12**
Lead 210	**4.8**		**2.2**		**2.5**	**08/29/12**	**09/19/12**
Lead 212	**0.32**		**0.11**		**0.13**	**08/29/12**	**09/19/12**
Lead 214	**3.01**		**0.42**		**0.20**	**08/29/12**	**09/19/12**
Potassium 40	**6.0**		**1.5**		**0.8**	**08/29/12**	**09/19/12**
Protactinium 231	0.16	U	0.32		2.9	08/29/12	09/19/12
Radium (226)	**2.93**		**0.44**	1.00	**0.16**	**08/29/12**	**09/19/12**
Radium 228	0.19	U	0.19		0.39	08/29/12	09/19/12
Thallium 208	0.074	U	0.073		0.098	08/29/12	09/19/12
Thorium 234	1.02	U	0.79		2.3	08/29/12	09/19/12
Uranium 235	0.27	U	0.29		0.40	08/29/12	09/19/12
Uranium 238	1.02	U	0.79		2.3	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: SOUTH 5

Radiochemistry

Lab Sample ID: F2H270452-021
Work Order: MWA9E
Matrix: SOLID

Date Collected: 07/31/12 1620
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2242093		Yld %
Actinium 227	-0.6	U	1.0		1.7	08/29/12	09/19/12
Actinium 228	**0.90**		**0.44**		**0.73**	**08/29/12**	**09/19/12**
Bismuth 212	1.02	U	0.87		1.4	08/29/12	09/19/12
Bismuth 214	**35.2**		**3.8**		**0.4**	**08/29/12**	**09/19/12**
Lead 210	**21.8**		**5.5**		**5.9**	**08/29/12**	**09/19/12**
Lead 212	**0.79**		**0.26**		**0.37**	**08/29/12**	**09/19/12**
Lead 214	**37.4**		**4.0**		**0.5**	**08/29/12**	**09/19/12**
Potassium 40	**22.2**		**3.6**		**1.7**	**08/29/12**	**09/19/12**
Protactinium 231	0.7	U	2.7		4.0	08/29/12	09/19/12
Radium (226)	**35.2**		**3.8**	1.0	**0.4**	**08/29/12**	**09/19/12**
Radium 228	**0.90**		**0.44**		**0.73**	**08/29/12**	**09/19/12**
Thallium 208	0.13	U	0.20		0.25	08/29/12	09/19/12
Thorium 234	1.4	U	1.2		6.5	08/29/12	09/19/12
Uranium 235	0.17	U	0.92		1.5	08/29/12	09/19/12
Uranium 238	1.4	U	1.2		6.5	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: SOUTH 5 DUP

Radiochemistry

Lab Sample ID: F2H270452-021X
Work Order: MWA9E
Matrix: SOLID

Date Collected: 07/31/12 1620
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2242093		Yld %
Actinium 227	0.04	U	0.12		1.5	08/29/12	09/19/12
Actinium 228	**0.82**		**0.46**		**0.70**	**08/29/12**	**09/19/12**
Bismuth 212	0.0	U	0.65		1.6	08/29/12	09/19/12
Bismuth 214	**34.8**		**3.7**		**0.4**	**08/29/12**	**09/19/12**
Lead 210	**26.4**		**5.6**		**5.6**	**08/29/12**	**09/19/12**
Lead 212	**0.72**		**0.25**		**0.36**	**08/29/12**	**09/19/12**
Lead 214	**37.0**		**3.9**		**0.5**	**08/29/12**	**09/19/12**
Potassium 40	**19.8**		**3.2**		**1.8**	**08/29/12**	**09/19/12**
Protactinium 231	1.4	U	3.7		6.1	08/29/12	09/19/12
Radium (226)	**34.8**		**3.7**	1.0	**0.4**	**08/29/12**	**09/19/12**
Radium 228	**0.82**		**0.46**		**0.70**	**08/29/12**	**09/19/12**
Thallium 208	0.12	U	0.18		0.24	08/29/12	09/19/12
Thorium 234	1.2	U	3.5		5.9	08/29/12	09/19/12
Uranium 235	-0.27	U	0.88		1.5	08/29/12	09/19/12
Uranium 238	1.2	U	3.5		5.9	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: WEST A

Radiochemistry

Lab Sample ID: F2H270452-022
Work Order: MWA9F
Matrix: SOLID

Date Collected: 08/01/12 1112
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2242093		Yld %
Actinium 227	-0.35	U	0.53		0.87	08/29/12	09/19/12
Actinium 228	0.52		0.20		0.30	08/29/12	09/19/12
Bismuth 212	0.54	U	0.44		0.68	08/29/12	09/19/12
Bismuth 214	5.33		0.64		0.17	08/29/12	09/19/12
Lead 210	2.9		1.8		2.8	08/29/12	09/19/12
Lead 212	0.73		0.16		0.16	08/29/12	09/19/12
Lead 214	5.87		0.68		0.18	08/29/12	09/19/12
Potassium 40	21.9		2.9		0.7	08/29/12	09/19/12
Protactinium 231	0.90	U	0.91		1.8	08/29/12	09/19/12
Radium (226)	5.33		0.64	1.00	0.17	08/29/12	09/19/12
Radium 228	0.52		0.20		0.30	08/29/12	09/19/12
Thallium 208	0.280		0.077		0.062	08/29/12	09/19/12
Thorium 234	0.9	U	1.7		2.8	08/29/12	09/19/12
Uranium 235	0.17	U	0.43		0.72	08/29/12	09/19/12
Uranium 238	0.9	U	1.7		2.8	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: WEST B

Radiochemistry

Lab Sample ID: F2H270452-023
Work Order: MWA9G
Matrix: SOLID

Date Collected: 08/01/12 1114
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2242093		Yld %
Actinium 227	0.37		0.15		0.13	08/29/12	09/19/12
Actinium 228	0.65		0.17		0.18	08/29/12	09/19/12
Bismuth 212	0.29	U	0.35		0.57	08/29/12	09/19/12
Bismuth 214	0.77		0.17		0.11	08/29/12	09/19/12
Lead 210	1.6	U	1.5		2.0	08/29/12	09/19/12
Lead 212	0.68		0.14		0.11	08/29/12	09/19/12
Lead 214	0.91		0.18		0.12	08/29/12	09/19/12
Potassium 40	21.4		3.0		0.6	08/29/12	09/19/12
Protactinium 231	0.57	U	0.54		1.9	08/29/12	09/19/12
Radium (226)	0.77		0.17	1.00	0.11	08/29/12	09/19/12
Radium 228	0.65		0.17		0.18	08/29/12	09/19/12
Thallium 208	0.196		0.068		0.067	08/29/12	09/19/12
Thorium 234	0.8	U	1.0		1.7	08/29/12	09/19/12
Uranium 235	0.20	U	0.25		0.43	08/29/12	09/19/12
Uranium 238	0.8	U	1.0		1.7	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: WEST D

Radiochemistry

Lab Sample ID: F2H270452-024
Work Order: MWA9H
Matrix: SOLID

Date Collected: 08/01/12 1120
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2242093		Yld %
Actinium 227	0.0	U	0.27		1.2	08/29/12	09/19/12
Actinium 228	**0.99**		**0.24**		**0.22**	**08/29/12**	**09/19/12**
Bismuth 212	0.12	U	0.46		0.79	08/29/12	09/19/12
Bismuth 214	**2.38**		**0.35**		**0.14**	**08/29/12**	**09/19/12**
Lead 210	**5.0**		**2.4**		**2.7**	**08/29/12**	**09/19/12**
Lead 212	**0.74**		**0.16**		**0.16**	**08/29/12**	**09/19/12**
Lead 214	**2.48**		**0.34**		**0.16**	**08/29/12**	**09/19/12**
Potassium 40	**21.7**		**3.0**		**1.0**	**08/29/12**	**09/19/12**
Protactinium 231	0.50	U	0.45		2.4	08/29/12	09/19/12
Radium (226)	**2.38**		**0.35**	1.00	**0.14**	**08/29/12**	**09/19/12**
Radium 228	**0.99**		**0.24**		**0.22**	**08/29/12**	**09/19/12**
Thallium 208	**0.281**		**0.082**		**0.078**	**08/29/12**	**09/19/12**
Thorium 234	1.8	U	1.6		2.1	08/29/12	09/19/12
Uranium 235	0.09	U	0.24		0.62	08/29/12	09/19/12
Uranium 238	1.8	U	1.6		2.1	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: WEST E

Radiochemistry

Lab Sample ID: F2H270452-025
Work Order: MWA9J
Matrix: SOLID

Date Collected: 08/01/12 1127
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2242093		Yld %
Actinium 227	-0.39	U	0.52		0.84	08/29/12	09/19/12
Actinium 228	0.68		0.25		0.33	08/29/12	09/19/12
Bismuth 212	0.27	U	0.44		0.74	08/29/12	09/19/12
Bismuth 214	4.69		0.60		0.18	08/29/12	09/19/12
Lead 210	5.7		2.2		2.8	08/29/12	09/19/12
Lead 212	0.70		0.20		0.18	08/29/12	09/19/12
Lead 214	4.85		0.72		0.24	08/29/12	09/19/12
Potassium 40	22.7		3.1		0.8	08/29/12	09/19/12
Protactinium 231	0.4	U	1.2		3.0	08/29/12	09/19/12
Radium (226)	4.69		0.60	1.00	0.18	08/29/12	09/19/12
Radium 228	0.68		0.25		0.33	08/29/12	09/19/12
Thallium 208	0.26		0.12		0.12	08/29/12	09/19/12
Thorium 234	0.84	U	0.67		3.2	08/29/12	09/19/12
Uranium 235	0.24	U	0.45		0.70	08/29/12	09/19/12
Uranium 238	0.84	U	0.67		3.2	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: WEST C

Radiochemistry

Lab Sample ID: F2H270452-026
Work Order: MWA9K
Matrix: SOLID

Date Collected: 08/01/12 1124
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2242093		Yld %
Actinium 227	-0.43	U	0.42		0.68	08/29/12	09/19/12
Actinium 228	**0.81**		**0.26**		**0.27**	**08/29/12**	**09/19/12**
Bismuth 212	**0.82**		**0.41**		**0.41**	**08/29/12**	**09/19/12**
Bismuth 214	**1.32**		**0.25**		**0.16**	**08/29/12**	**09/19/12**
Lead 210	1.2	U	1.3		2.0	08/29/12	09/19/12
Lead 212	**0.61**		**0.13**		**0.12**	**08/29/12**	**09/19/12**
Lead 214	**1.37**		**0.21**		**0.13**	**08/29/12**	**09/19/12**
Potassium 40	**19.4**		**2.7**		**0.6**	**08/29/12**	**09/19/12**
Protactinium 231	0.49	U	0.64		2.0	08/29/12	09/19/12
Radium (226)	**1.32**		**0.25**	1.00	**0.16**	**08/29/12**	**09/19/12**
Radium 228	**0.81**		**0.26**		**0.27**	**08/29/12**	**09/19/12**
Thallium 208	**0.243**		**0.096**		**0.085**	**08/29/12**	**09/19/12**
Thorium 234	1.1	U	1.5		2.0	08/29/12	09/19/12
Uranium 235	-0.02	U	0.11		0.51	08/29/12	09/19/12
Uranium 238	1.1	U	1.5		2.0	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: WEST F

Radiochemistry

Lab Sample ID: F2H270452-027
Work Order: MWA9L
Matrix: SOLID

Date Collected: 08/01/12 1130
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2242093		Yld %
Actinium 227	-0.52	U	0.74		1.2	08/29/12	09/19/12
Actinium 228	1.26		0.43		0.25	08/29/12	09/19/12
Bismuth 212	0.78	U	0.65		0.92	08/29/12	09/19/12
Bismuth 214	1.12		0.30		0.21	08/29/12	09/19/12
Lead 210	3.8		2.5		3.6	08/29/12	09/19/12
Lead 212	0.87		0.25		0.23	08/29/12	09/19/12
Lead 214	1.06		0.24		0.21	08/29/12	09/19/12
Potassium 40	10.7		2.8		2.0	08/29/12	09/19/12
Protactinium 231	0.38	U	0.56		3.9	08/29/12	09/19/12
Radium (226)	1.12		0.30	1.00	0.21	08/29/12	09/19/12
Radium 228	1.26		0.43		0.25	08/29/12	09/19/12
Thallium 208	0.27		0.12		0.13	08/29/12	09/19/12
Thorium 234	0.60	U	0.90		2.6	08/29/12	09/19/12
Uranium 235	0.21	U	0.43		0.69	08/29/12	09/19/12
Uranium 238	0.60	U	0.90		2.6	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: NORTH C

Radiochemistry

Lab Sample ID: F2H270452-028
Work Order: MWA9M
Matrix: SOLID

Date Collected: 08/01/12 1117
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2242093		Yld %
Actinium 227	-0.24	U	0.70		1.2	08/29/12	09/19/12
Actinium 228	**0.71**		**0.36**		**0.53**	**08/29/12**	**09/19/12**
Bismuth 212	0.45	U	0.67		1.1	08/29/12	09/19/12
Bismuth 214	**12.0**		**1.4**		**0.3**	**08/29/12**	**09/19/12**
Lead 210	**12.5**		**4.0**		**4.4**	**08/29/12**	**09/19/12**
Lead 212	**0.64**		**0.18**		**0.22**	**08/29/12**	**09/19/12**
Lead 214	**11.5**		**1.3**		**0.4**	**08/29/12**	**09/19/12**
Potassium 40	**20.4**		**3.4**		**1.5**	**08/29/12**	**09/19/12**
Protactinium 231	0.19	U	0.48		4.9	08/29/12	09/19/12
Radium (226)	**12.0**		**1.4**	1.0	**0.3**	**08/29/12**	**09/19/12**
Radium 228	**0.71**		**0.36**		**0.53**	**08/29/12**	**09/19/12**
Thallium 208	**0.27**		**0.14**		**0.14**	**08/29/12**	**09/19/12**
Thorium 234	0.07	U	0.20		4.7	08/29/12	09/19/12
Uranium 235	0.09	U	0.53		0.89	08/29/12	09/19/12
Uranium 238	0.07	U	0.20		4.7	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: NORTH A

Radiochemistry

Lab Sample ID: F2H270452-029
Work Order: MWA9N
Matrix: SOLID

Date Collected: 08/01/12 1136
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2242093		Yld %
Actinium 227	0.08	U	0.15		0.25	08/29/12	09/19/12
Actinium 228	**0.97**		**0.23**		**0.14**	**08/29/12**	**09/19/12**
Bismuth 212	0.39	U	0.41		0.65	08/29/12	09/19/12
Bismuth 214	**1.0**		**0.20**		**0.12**	**08/29/12**	**09/19/12**
Lead 210	1.9	U	1.7		2.1	08/29/12	09/19/12
Lead 212	**0.73**		**0.14**		**0.11**	**08/29/12**	**09/19/12**
Lead 214	**1.40**		**0.24**		**0.14**	**08/29/12**	**09/19/12**
Potassium 40	**19.5**		**2.8**		**0.5**	**08/29/12**	**09/19/12**
Protactinium 231	0.39	U	0.59		2.0	08/29/12	09/19/12
Radium (226)	**1.0**		**0.20**	1.00	**0.12**	**08/29/12**	**09/19/12**
Radium 228	**0.97**		**0.23**		**0.14**	**08/29/12**	**09/19/12**
Thallium 208	**0.322**		**0.084**		**0.059**	**08/29/12**	**09/19/12**
Thorium 234	1.5	U	1.1		1.5	08/29/12	09/19/12
Uranium 235	0.06	U	0.22		0.37	08/29/12	09/19/12
Uranium 238	1.5	U	1.1		1.5	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Tetra Tech, EMI (ARRA)

Client Sample ID: NORTH B

Radiochemistry

Lab Sample ID: F2H270452-030
Work Order: MWA9P
Matrix: SOLID

Date Collected: 08/01/12 1142
Date Received: 08/27/12 0925

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2242093		Yld %
Actinium 227	0.09	U	0.17		0.75	08/29/12	09/19/12
Actinium 228	**0.76**		**0.24**		**0.14**	**08/29/12**	**09/19/12**
Bismuth 212	0.24	U	0.39		0.67	08/29/12	09/19/12
Bismuth 214	**0.88**		**0.20**		**0.11**	**08/29/12**	**09/19/12**
Lead 210	1.6	U	1.4		2.3	08/29/12	09/19/12
Lead 212	**0.70**		**0.14**		**0.12**	**08/29/12**	**09/19/12**
Lead 214	**1.04**		**0.20**		**0.09**	**08/29/12**	**09/19/12**
Potassium 40	**19.5**		**3.0**		**0.9**	**08/29/12**	**09/19/12**
Protactinium 231	0.6	U	1.1		1.9	08/29/12	09/19/12
Radium (226)	**0.88**		**0.20**	1.00	**0.11**	**08/29/12**	**09/19/12**
Radium 228	**0.76**		**0.24**		**0.14**	**08/29/12**	**09/19/12**
Thallium 208	**0.243**		**0.070**		**0.047**	**08/29/12**	**09/19/12**
Thorium 234	0.50	U	0.71		2.3	08/29/12	09/19/12
Uranium 235	0.07	U	0.26		0.45	08/29/12	09/19/12
Uranium 238	0.50	U	0.71		2.3	08/29/12	09/19/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

METHOD BLANK REPORT

Radiochemistry

Client Lot ID: F2H270452
Matrix: SOLID

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Yld %	Prep Date	Analysis Date	Lab Sample ID
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2242093				F2H290000-093B
Actinium 227	0.07	U	0.14		0.43		08/29/12	09/19/12	
Actinium 228	0.0	U	0.066		0.37		08/29/12	09/19/12	
Bismuth 212	0.0	U	0.096		0.52		08/29/12	09/19/12	
Bismuth 214	-0.02	U	0.17		0.20		08/29/12	09/19/12	
Lead 210	1.8	U	1.3		2.2		08/29/12	09/19/12	
Lead 212	0.022	U	0.064		0.12		08/29/12	09/19/12	
Lead 214	-0.006	U	0.013		0.18		08/29/12	09/19/12	
Potassium 40	0.15	U	0.29		0.67		08/29/12	09/19/12	
Protactinium 231	-0.12	U	0.69		1.3		08/29/12	09/19/12	
Radium (226)	-0.02	U	0.17	1.00	0.20		08/29/12	09/19/12	
Radium 228	0.0	U	0.066		0.37		08/29/12	09/19/12	
Thallium 208	0.011	U	0.059		0.082		08/29/12	09/19/12	
Thorium 234	0.35	U	0.48		1.7		08/29/12	09/19/12	
Uranium 235	0.001	U	0.025		0.33		08/29/12	09/19/12	
Uranium 238	0.35	U	0.48		1.7		08/29/12	09/19/12	
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2243081				F2H300000-081B
Actinium 227	0.009	U	0.096		0.30		08/29/12	09/19/12	
Actinium 228	0.019	U	0.087		0.19		08/29/12	09/19/12	
Bismuth 212	0.11	U	0.19		0.34		08/29/12	09/19/12	
Bismuth 214	0.077	U	0.091		0.12		08/29/12	09/19/12	
Lead 210	-0.02	U	0.72		1.5		08/29/12	09/19/12	
Lead 212	0.001	U	0.037		0.076		08/29/12	09/19/12	
Lead 214	0.077	U	0.061		0.089		08/29/12	09/19/12	
Potassium 40	-0.2	U	8.4		1.5		08/29/12	09/19/12	
Protactinium 231	-0.23	U	0.70		1.2		08/29/12	09/19/12	
Radium (226)	0.077	U	0.091	1.00	0.12		08/29/12	09/19/12	
Radium 228	0.019	U	0.087		0.19		08/29/12	09/19/12	
Thallium 208	-0.002	U	0.026		0.053		08/29/12	09/19/12	
Thorium 234	0.47	U	0.58		0.93		08/29/12	09/19/12	
Uranium 235	0.049	U	0.087		0.14		08/29/12	09/19/12	
Uranium 238	0.47	U	0.58		0.93		08/29/12	09/19/12	

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined using instrument performance only
Bold results are greater than the MDC.

U Result is less than the sample detection limit.

Laboratory Control Sample Report

Radiochemistry

Client Lot ID: F2H270452
Matrix: SOLID

Parameter	Spike Amount	Result	Total Uncert. (2 σ+/-)	MDC	% Yld	% Rec	Lab Sample ID QC Control Limits
Gamma Ra-226 & Hits By EML GA-01-R MOD		pCi/g		GA-01-R MOD			F2H290000-093C
Radium (226)	12.2	11.7	1.5	0.5		96	(73 - 107)
Thorium 232	9.50	9.9	1.6	0.9		104	(82 - 126)
	Batch #:	2242093		Analysis Date:	09/19/12		
Gamma Ra-226 & Hits By EML GA-01-R MOD		pCi/g		GA-01-R MOD			F2H300000-081C
Radium (226)	12.2	11.6	1.5	0.4		95	(73 - 107)
Thorium 232	9.50	9.6	1.3	0.7		101	(82 - 126)
	Batch #:	2243081		Analysis Date:	09/19/12		

NOTE(S)

MDC is determined by instrument performance only
Calculations are performed before rounding to avoid round-off error in calculated results

DUPLICATE EVALUATION REPORT

Radiochemistry

Client Lot ID: F2H270452
Matrix: SOLID

Date Sampled: 08/04/12
Date Received: 08/27/12

Parameter	SAMPLE Result		Total Uncert. (2σ +/-)	% Yld	DUPLICATE Result		Total Uncert. (2 σ +/-)	% Yld	QC Sample ID Precision	
Gamma Ra-226 & Hits By EML GA-01-R MOD		**pCi/g**			**GA-01-R MOD**				**F2H270452-001**	
Actinium 227	0.09	U	0.24		-0.35	U	0.60		328	%RPD
Actinium 228	0.59		0.19		0.65		0.21		9	%RPD
Bismuth 212	0.22	U	0.30		0.0	U	0.46		200	%RPD
Bismuth 214	0.69		0.16		0.75		0.22		8	%RPD
Lead 210	2.5		1.2		1	U	1.6		88	%RPD
Lead 212	0.50		0.11		0.49		0.18		2	%RPD
Lead 214	0.62		0.16		0.91		0.20		39	%RPD
Potassium 40	17.0		2.4		16.5		3.0		3	%RPD
Protactinium 231	0.39	U	0.52		0.0	U	1.2		200	%RPD
Radium (226)	0.69		0.16		0.75		0.22		8	%RPD
Radium 228	0.59		0.19		0.65		0.21		9	%RPD
Thallium 208	0.120		0.055		0.173		0.078		37	%RPD
Thorium 234	0.33	U	0.39		0.7	U	1.4		77	%RPD
Uranium 235	0.12	U	0.22		0.15	U	0.26		23	%RPD
Uranium 238	0.33	U	0.39		0.7	U	1.4		77	%RPD
	Batch #:		2243081 (Sample)		2243081 (Duplicate)					
Gamma Ra-226 & Hits By EML GA-01-R MOD		**pCi/g**			**GA-01-R MOD**				**F2H270452-021**	
Actinium 227	-0.6	U	1.0		0.04	U	0.12		226	%RPD
Actinium 228	0.90		0.44		0.82		0.46		10	%RPD
Bismuth 212	1.02	U	0.87		0.0	U	0.65		200	%RPD
Bismuth 214	35.2		3.8		34.8		3.7		1	%RPD
Lead 210	21.8		5.5		26.4		5.6		19	%RPD
Lead 212	0.79		0.26		0.72		0.25		8	%RPD
Lead 214	37.4		4.0		37.0		3.9		1	%RPD
Potassium 40	22.2		3.6		19.8		3.2		12	%RPD
Protactinium 231	0.7	U	2.7		1.4	U	3.7		67	%RPD
Radium (226)	35.2		3.8		34.8		3.7		1	%RPD
Radium 228	0.90		0.44		0.82		0.46		10	%RPD
Thallium 208	0.13	U	0.20		0.12	U	0.18		5	%RPD
Thorium 234	1.4	U	1.2		1.2	U	3.5		17	%RPD
Uranium 235	0.17	U	0.92		-0.27	U	0.88		907	%RPD
Uranium 238	1.4	U	1.2		1.2	U	3.5		17	%RPD
	Batch #:		2242093 (Sample)		2242093 (Duplicate)					

NOTE(S)

Data are incomplete without the case narrative.
Calculations are performed before rounding to avoid round-off error in calculated results

U Result is less than the sample detection limit.

F2H270452 CLIENT ANALYSIS SUMMARY

Storage Loc: RAD

Project Manager: EKS | Quote #: 90680 | SDG:

Project: | Radiation - Standard Precision

PO#: | Report to: Emily Fisher

Client: 3333030 Tetra Tech, EMI (ARRA)

#SMPS In LOT: 0

Date Received: 2012-08-27

Analytical Due Date: 2012-09-24

Report Due Date: 2012-09-26

Report Type: B Standard Report

EDD Code: 00

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
1	REF-1			2012-08-04 / 923	MWA8P	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
2	REF-2			2012-08-04 / 925	MWA8Q	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
3	REF-3			2012-08-04 / 927	MWA8R	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
4	REF-4			2012-08-04 / 929	MWA8T	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
5	REF-5			2012-08-04 / 932	MWA8V	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
6	REF-6			2012-08-04 / 934	MWA8W	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
7	REF-7			2012-08-04 / 937	MWA8X	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

F2H270452 CLIENT ANALYSIS SUMMARY

Storage Loc: RAD

Project Manager: EKS
Quote #: 90680 SDG:
Date Received: 2012-08-27

Project:
Radiation - Standard Precision
Analytical Due Date: 2012-09-24

PO#:
Report to: Emily Fisher
Report Due Date: 2012-09-26

Client: 3333030 Tetra Tech, EMI (ARRA)
#SMPS In LOT: 0
Report Type: B Standard Report
EDD Code: 00

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
8	PIPE #1			2012-08-03 / 1406	MWA80	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
9	PIPE #6			2012-08-03 / 1530	MWA81	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
10	PIPE #7			2012-08-03 / 1658	MWA82	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
11	PIPE #8			2012-08-03 / 1637	MWA83	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
12	PIPE #10			2012-08-03 / 1716	MWA84	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
13	AREA 3 #1			2012-08-03 / 1139	MWA85	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
14	AREA 3 #6			2012-08-03 / 1135 54 EKS 8/31/12	MWA86	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A

F2H270452 CLIENT ANALYSIS SUMMARY

Storage Loc: RAD
Date Received: 2012-08-27
Analytical Due Date: 2012-09-24
Report Due Date: 2012-09-26
Report Type: B Standard Report
EDD Code: 00

Project Manager: EKS
Project:
PO#:
Client: 3333030 Tetra Tech, EMI (ARRA)

Quote #: 90680 SDG:
Radiation - Standard Precision
Report to: Emily Fisher
#SMPS In LOT: 0

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
15	AREA 3 #7R			2012-08-03 / 1717	MWA87	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
16	AREA 1			2012-08-03 / 1726	MWA88	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
17	AREA 5			2012-08-01 / 1704	MWA89	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
18	AREA 6 #3			2012-08-02 / 1000	MWA9A	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
19	SOUTH 3			2012-07-31 / 1615	MWA9C	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
20	SOUTH 4			2012-07-31 / 1608	MWA9D	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
21	SOUTH 5			2012-07-31 / 1620	MWA9E	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A

F2H270452 CLIENT ANALYSIS SUMMARY

Storage Loc: RAD

Project Manager: EKS | Quote #: 90680 | SDG:

Project: | Radiation - Standard Precision

PO#: | Report to: Emily Fisher

Client: 3333030 Tetra Tech, EMI (ARRA)

#SMPS In LOT: 0

Date Received: 2012-08-27

Analytical Due Date: 2012-09-24

Report Due Date: 2012-09-26

Report Type: B Standard Report

EDD Code: 00

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
22	WEST A			2012-08-01 / 1112	MWA9F	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day in-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
23	WEST B			2012-08-01 / 1114	MWA9G	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day in-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
24	WEST D			2012-08-01 / 1120	MWA9H	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day in-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
25	WEST E			2012-08-01 / 1127	MWA9J	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day in-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
26	WEST C			2012-08-01 / 1124	MWA9K	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day in-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
27	WEST F			2012-08-01 / 1130	MWA9L	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day in-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
28	NORTH C			2012-08-01 / 1117	MWA9M	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day in-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A

F2H270452

CLIENT ANALYSIS SUMMARY

Storage Loc: RAD

Project Manager: EKS
Quote #: 90680 SDG:
Project:
Radiation - Standard Precision
PO#:
Report to: Emily Fisher
Client: 3333030 Tetra Tech, EMI (ARRA)
#SMPS in LOT: 0

Date Received: 2012-08-27
Analytical Due Date: 2012-09-24
Report Due Date: 2012-09-26
Report Type: B Standard Report
EDD Code: 00

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
29	NORTH A			2012-08-01 / 1136	MWA9N	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

SAMPLE #	CLIENT SAMPLE ID	Site ID	Client Matrix	DATE/TIME SAMPLED	WORKORDER	A
30	NORTH B			2012-08-01 / 1142	MWA9P	SOLID

SAMPLE COMMENTS:

XX	ZV		RAD SCREEN	SOLID, RAD SCREEN	RA	IN-HOUSE RAD SCREEN	01	STANDARD TEST SET	PROT: A	WRK LOC	06
XX	0B	EML	GA-01-R MOD	SOLID, GA-01-R MOD, Gamma Ra-226 & Hits	J9	Dry, Grind, and Fill Geometry -> 21 day In-growth	01	STANDARD TEST SET	PROT: R	WRK LOC	06

TestAmerica St. Louis CUL 479
13715 Rider Trail North
Earth City, MO 63045
Phone 314.298.8566 fax 314.298.8757

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

Client Contact	Project Manager: Rob Monnig	Site Contact:	Date: 8/23/12	COC No:
Tetra Tech	Tel/Fax: 816-729-5621	Lab Contact:	Carrier:	1 of 3 COCs
415 Oak Street	Analysis Turnaround Time			Job No.
Kansas City, MO	Calendar (C) or Work Days (W) ____			
(816) 412-1775 Phone	TAT if different from Below ____			
(xxx) xxx-xxxx FAX	☐ 2 weeks			SDG No.
Project Name: Standard Precision	☐ 1 week			
Site:	☐ 2 days			
PO# 1086244	☐ 1 day			Sampler: Robert Monnig

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample	Gamma Scan w/ 21-day ingrowth for Ra-226	Sample Specific Notes:
REF-1 8/4/12 RM	~~8/3/12~~	0923			1		X	
REF-2	↓	0925			1		X	
REF-3	↓	0927			1		X	
REF-4	↓	0929			1		X	
REF-5	↓	0932			1		X	
REF-6	↓	0934			1		X	
REF-7	↓	0937			1		X	
Pipe #1	8/3/12	1406			1		X	
Pipe #6	↓	1530			1		X	
Pipe #7	↓	1558			1		X	
Pipe #8	↓	1637			1		X	
Pipe #10	↓	1716			1		X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ____

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* *Poison B* ☐ *Unknown* ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* ____ *Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by: [signature]	Company: Tetra Tech	Date/Time: 8/23/12 1000	Received by: FedEx	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by: [signature]	Company: TA	Date/Time: 8/27/12 0925
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Phone 314.298.8566 fax 314.298.8757

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact	Project Manager: Rob Monnig	Site Contact:	Date: 8/23/12	COC No:
Tetra Tech	Tel/Fax: 816-729-5621	Lab Contact:	Carrier:	2 of 3 COCs
415 Oak Street	Analysis Turnaround Time			Job No.
Kansas City, MO	Calendar (C) or Work Days (W) ______			
(816) 412-1775 Phone	TAT if different from Below ______			
(xxx) xxx-xxxx FAX	☐ 2 weeks			SDG No.
Project Name: Standard Precision	☐ 1 week			
Site:	☐ 2 days			
PO# 10816244	☐ 1 day			Sampler: Robert Monnig

Analysis column: Filtered Sample; Gamma Scan w/ 21-day ingrowth for Radium

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample	Gamma Scan w/ 21-day ingrowth for Radium	Sample Specific Notes:
Area 3 #1	8/3/12	1139			1		X	
Area 3 #6	8/3/12	1154			1		X	
Area 3 #7R	8/3/12	1717			1		X	
Area 1	8/3/12	1726			1		X	
Area 5	8/1/12	1704			1		X	
Area 6 #3	8/2/12	1000			1		X	
South 3	7/31/12	1615			1		X	
South 4	7/31/12	1608			1		X	
South 5	7/31/12	1620			1		X	
West A	8/1/12	1112			1		X	
West B	8/1/12	1114			1		X	
West D	8/1/12	1120			1		X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ______

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* *Poison B* ☐ *Unknown* ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For ______ Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	Tetra Tech	8/23/12 1600	FedEx		
Relinquished by:	Company:	Date/Time:	Received by: [signature]	Company: TA	Date/Time: 8/27/12 0925
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Phone 314.298.8566 fax 314.298.8757

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

Client Contact	Project Manager: Rob Monnig	Site Contact:	Date: 8/23/12	COC No:
Tetra Tech	Tel/Fax: 816-729-5621	Lab Contact:	Carrier:	3 of 3 COCs
415 Oak Street	Analysis Turnaround Time			Job No.
Kansas City, MO	Calendar (C) or Work Days (W) ______			
(816) 412-1775 Phone	TAT if different from Below ______			
(xxx) xxx-xxxx FAX	☐ 2 weeks			SDG No.
Project Name: Standard Precision	☐ 1 week			
Site:	☐ 2 days			
PO# 10810244	☐ 1 day			Sampler: Robert Monnig

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample	Gamma Scan w/ 21-day ingrowth for Ra-226	Sample Specific Notes:
West E	8/1/12	1127			1		X	
West C	8/1/12	1124			1		X	
West F	8/1/12	1130			1		X	
North C	8/1/12	1117			1		X	
North A	8/1/12	1136			1		X	
North B	8/1/12	1142			1		X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ______

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* *Poison B* ☐ *Unknown* ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* ______ *Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	Tetra Tech	8/23/12 1800	FedEx		
Relinquished by:	Company:	Date/Time:	Received by: [signature]	Company: TA	Date/Time: 8/27/12 0925
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Lot #(s): F2H270452

CUR Form #: 4 7 9

CONDITION UPON RECEIPT FORM

Client: Tetra Tech

Quote No: 90680

COC/RFA No: N/A

Initiated By: bp Date: 8/27/12 Time: 0925

Shipping Information

Shipper: (FedEx) UPS DHL Courier Client Other: _____ Multiple Packages: Y (N)

Shipping # (s):*				Sample Temperature (s):**			
1.	4465 1405 9690	6.		1.	Ambient	6.	
2.		7.		2.		7.	
3.		8.		3.		8.	
4.		9.		4.		9.	
5.		10.		5.		10.	

*Numbered shipping lines correspond to Numbered Sample Temp lines

**Sample must be received at 4°C ± 2°C- If not, note contents below. Temperature variance does NOT affect the following: Metals-Liquid; Rad tests- Liquid or Solids; Perchlorate

Condition (Circle "Y" for yes, "N" for no and "N/A" for not applicable):

1.	Y (N)	Are there custody seals present on the cooler?	8.	Y (N)	Are there custody seals present on bottles?
2.	Y N (N/A)	Do custody seals on cooler appear to be tampered with?	9.	Y N (N/A)	Do custody seals on bottles appear to be tampered with?
3.	(Y) N	Were contents of cooler frisked after opening, but before unpacking?	10.	Y N (N/A)	Was sample received with proper pH[1]? (If not, make note below)
4.	(Y) N	Sample received with Chain of Custody?	11.	Y N (N/A)	Containers for C-14, H-3 & I-129/131 marked with "Do Not Preserve" label?
5.	(Y) N N/A	Does the Chain of Custody match sample ID's on the container(s)?	12.	(Y) N	Sample received in proper containers?
6.	(Y) N	Was sample received broken?	13.	Y N (N/A)	Headspace in VOA or TOX liquid samples? (If Yes, note sample ID's below)
7.	(Y) N	Is sample volume sufficient for analysis?	14.	Y N (N/A)	Was Internal COC/Workshare received?

[1] For DOE-AL (Pantex, LANL, Sandia) sites, pH of ALL containers received must be verified, EXCEPT VOA, TOX, Oil & Grease and soils.

Notes: Samples Pipe #10 & South 3 received with lids removed from the samples.

Corrective Action:

☐ Client Contact Name: _____ Informed by: _____

☐ Sample(s) processed "as is"

☐ Sample(s) on hold until: _____ If released, notify: _____

Project Management Review: GJS Date: 9/4/12

THIS FORM MUST BE COMPLETED AT THE TIME THE ITEMS ARE BEING CHECKED IN. IF ANY ITEM IS COMPLETED BY SOMEONE OTHER THAN THE INITIATOR, THEN THAT PERSON IS REQUIRED TO APPLY THEIR INITIAL AND THE DATE NEXT TO THAT ITEM.

ADMIN-0004 rev13, REVISED 05/27/11 \\Slsvr01\QA\FORMS\ST-LOUIS\ADMIN\Admin-0004 CUR.doc

Tetra Tech, EMI (ARRA)

Client Sample ID: BACKFILL

Radiochemistry

Lab Sample ID: F2G270459-018
Work Order: MVVLA
Matrix: SOLID

Date Collected: 07/24/12 1000
Date Received: 07/27/12 0920

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	mdc	Prep Date	Analysis Date
Gamma Ra-226 & Hits By EML GA-01-R MOD			pCi/g		Batch # 2213121		Yld %
Actinium 227	0.07	U	0.12		1.3	07/31/12	08/21/12
Actinium 228	**0.94**		**0.21**		**0.13**	**07/31/12**	**08/21/12**
Bismuth 212	0.30	U	0.39		0.66	07/31/12	08/21/12
Bismuth 214	**0.89**		**0.18**		**0.12**	**07/31/12**	**08/21/12**
Lead 210	1.4	U	1.7		2.4	07/31/12	08/21/12
Lead 212	**0.79**		**0.16**		**0.13**	**07/31/12**	**08/21/12**
Lead 214	**0.87**		**0.16**		**0.13**	**07/31/12**	**08/21/12**
Potassium 40	**18.1**		**2.6**		**0.5**	**07/31/12**	**08/21/12**
Protactinium 231	0.44	U	0.59		1.8	07/31/12	08/21/12
Radium (226)	**0.89**		**0.18**	1.00	**0.12**	**07/31/12**	**08/21/12**
Radium 228	**0.94**		**0.21**		**0.13**	**07/31/12**	**08/21/12**
Thallium 208	**0.325**		**0.079**		**0.057**	**07/31/12**	**08/21/12**
Thorium 234	0.53	U	0.68		2.2	07/31/12	08/21/12
Uranium 235	0.16	U	0.26		0.48	07/31/12	08/21/12
Uranium 238	0.53	U	0.68		2.2	07/31/12	08/21/12

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC.

U Result is less than the sample detection limit.